SALMON RIVER HABITAT ENHANCEMENT

ANNUAL REPORT FY 1984, PART 1

BY

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DIVISION OF FISH AND WILDLIFE

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PREFACE

This project, No. 83-359, was funded by the Bonneville Power Administration (BPA) under Contract No. DE-AI79-84BP14383.

This report has four volumes: a project annual report (Part 1) and three appended reports (Parts 2, 3, and 4). The project annual report contains reports for three subprojects within Project 83-359. Subproject I involved the determining of feasible alternatives that could be implemented to enhance salmonid habitat on patented land on upper Bear Valley Creek, Valley County, Idaho. J. M. Montgomery, Consultant Engineers, of Boise, Idaho, a subcontractor within Project 83-359, conducted the Feasibility Study and submitted a Feasibility Report (Part 2). Montgomery, after using a set of criteria to rate all proposed preliminary alternatives, also submitted a Recommended Alternative Report (Part 3). After the landowner found the Alternative Report unacceptable for implementation, negotiations produced a solution to the overall plan for implementation that was feasible and acceptable to all parties, the Preferred Alternative Report (Part 4), also produced by Montgomery. Subproject I also included the evaluation (pretreatment during 1984) of the implementation of an enhancement alternative. Subproject II is the coordination/consultation activities of the Project Leader in relation to other BPA-funded habitat projects that have or will occur on streams that exist within the Treaty (Fort Bridger Treaty of 1868) fishing areas of the Shoshone-Bannock Indian Tribes, Fort Hall Reservation, Idaho. Subproject III involved habitat inventories, fish inventories, and habitat problem identifications in the Yankee and East Forks of the Salmon River (only the Yankee Fork was completed in 1984).

Copies of the Annual Report may be obtained from:

U.S. Department of Energy
Bonneville Power Administration
Division of Fish and Wildlife - PJ
P.O. Box 3621
Portland, OR 97208

SUBPROJECT I

Bear Valley Creek:

Enhancement Feasibility and Evaluation

ABSTRACT

Salmonid habitat (4.5 km) within an inactive placer mine near the headwaters of Bear Valley Creek, Idaho, will be enhanced via a project funded by Bonneville Power Administration (Measure 704 (d)(l), Table 2, Northwest Power Planning Council's 1984 Fish and Wildlife Program). Fine sediments (872 m3/year) from the privately-owned (Bear Valley Minerals, Inc., Denver) mine have covered spawning gravels and filled in rearing areas of chinook salmon (Oncorhvnchus tshawytscha) and steelhead trout (Salmo gairdneri) in the stream from the mid-1950's to the present..A feasibilitv study determined the best five alternatives for enhancing salmonid habitat on private land, which will, subsequently, influence habitat downstream. Negotiations with the landowner produced a preferred alternative which contained portions of two alternatives from the feasibility study. The preferred alternative includes stabilization and revegetaton of problem stream reaches and adjacent areas and a diversion channel if mining does occur. A construction easement must be obtained from the landowners prior to implementation. Treatment effects will be evaluated by monitoring aquatic habitat and fish communities over time. Physical (1 time/year) and biological (2 times/year) variables are being measured in seven sites within each of seven strata along the length (55 km) of Bear Valley Creek. Fish data were collected via snorkel-observations, electrofishing and seining. Baseline or pretreatment measurements were made in 1984. Minimum and maximum water temperatures ranged from 0 to 4 C and 14 to 19 C, respectively, in the stream during August and September. Riffle-pool area, flow, stream width and pool depth increased from upstream to downstream. Highest gradient (2.7%) was in the headwaters stratum. Strata above the mine and near the stream mouth had the highest amount (84 to 87 cm/stream width) of riparian cover, while the mine stratum had the least (30 cm/stream width). Highest frequencies of fine sediments on riffles occurred in strata immediately below the mine and immediately below the confluence with the largest tributary (Elk Creek) to Bear Valley Creek. In descending order of abundance, salmonid species in Bear Valley Creek included: chinook salmon, mountain whitefish (Prosopium williamsoni), steelhead/rainbow trout, brook trout (Salvelinus fontinalis), cutthroat trout (2. clarki), and.bull trout (2. confluentus). Shorthead sculpin (Cottus confusus) were present in all strata but we did not estimate abundance. Densities of age 0+ chinook salmon were highest (0.16 fish/m2 pool) in the stratum below the mine: densities were higher during August (0.11 fish/m pool) thoughout Bear Valley Creek. Length, weight and condition of age 0+ chinook salmon increased from downstream to upstream (ranges: 68 to 85 mm, 2.7 to 6.0 g, 0.82 to 0.94, respectively). Age 0+ steelhead/rainbow densities (0.002 to

0.11 fish/m' pool) were similar among, but variable within, strata. Densities of age 0+ mountain whitefish were highest (0.01 to 0.02 fish/m2 pool) in medial strata of Bear Valley Creek. Densities of adult whitefish were highest (0.01 to 0.02 fish/m^2 pool) in downstream strata and below the mined area. Highest density (0.005 fish/m2 pool) of adult brook trout occurred in the stratum immediately below the mined area. Highest density (0.005 fish/m^2 pool) of adult brook trout occurred in the stratum immediately below the mined area. Densities of adult cutthroat trout were highest (0.001 fish/m^2 pool) in downstream strata. Highest densities (0.02 fish/m^2 pool) of bull trout occurred in the headwaters stratum.

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INTRODUCTION

Bear Valley Creek, a major tributary of the Middle Fork of the Salmon River, is a spawning and rearing stream for wild stocks of spring chinook salmon (Oncorhvnchus tshawytscha) and-steelhead trout (Salmo gairdneri). Past redd counts (Internal data. Idaho Department of Fish and Game) indicate Bear Valley Creek was-the primary spawning stream for wild spring chinook salmon in the Salmon River, if not in the entire Columbia River system. Redd counts that exceeded one thousand per year in the mid-1950's have declined to less than 60 per year in the 1980's. Although verified as a steelhead spawning and rearing stream, extensive redd count data for the species does not exist.

Increased sedimentation in Bear Valley Creek has caused a general degradation of the aquatic habitat. Spawning riffles have been covered with layers of fine soils while rearing pools, important to salmon and steelhead trout up to and including the pre-snolt stage, have filled in with sand. Although other point and non-point sources nay contribute sediment to the stream, an inactive placer nine (active during mid- and late-1950's) near the headwaters has deposited large amounts (over 500,000 cubic meters since late 1950's; Brian Lining, personal communication) of sediment into the stream. Bear Valley Creek has downcut 2 to 5 n through 2.3 km of unconsolidated overburden in the nine. Sediment recruitment has averaged 900 cubic meters per year during the past 11 years, predominately from side cutting. However, a high potential for erosion exists for 200,000 to 400,000 cubic meters of remaining overburden following a 50- or 100-year event. Patented land below the nine (4.0 km), now owned by Bear Valley Minerals, Inc. of Denver, Colorado, still contains a large and very valuable ($450 million) ore body (euxenite (tantalum and columbium), thorium, and uranium). Present and future mining of the deposit remains questionable because of the Idaho Dredge Mine Act and the Wild and Scenic Rivers Act.

Members of the Shoshone-Bannock Indian Tribes have fished in Bear Valley Creek (guaranteed by the Fort Bridger Treaty of 1868) for salmon from aboriginal tines to 1978. Since 1978, the Tribes have voluntarily ceased fishing in the stream as a conservation effort. Tribal members had hoped that the declining wild stock would respond to the cessation of fishing with an increase in numbers. In addition, Idaho Department of Fish and Game considered Bear Valley Creek a "wild" stream which excluded the use of hatchery stocks to enhance the chinook salmon stock. Thus, local harvest management by the Tribe and State (no harvest since 1977) was one method of protecting and enhancing the wild stock of spring chinook salmon in Bear Valley Creek during the late 1970's and early 1980's.

In 1982, the Northwest Power Planning Council: recognized the importance of protecting and enhancing wild stocks of spring chinook salmon and steelhead trout in Bear Valley Creek; identified sedimentation as a key problem in the stream; and, listed the stream as a candidate for a habitat improvement project in their Columbia River Basin Fish and Wildlife Program (Northwest Power Planning Council 1982). The project would be funded by the Bonneville Power Administration (BPA) as an off-site mitigation effort for impacts on anadromous fish stocks caused by hydroelectric projects on the main stem Columbia and Snake rivers. The Planning Council was aware of the Shoshone-Bannock's interests and treaty rights on the stream and instructed BPA to fund the enhancement project on Bear Valley Creek with the Tribes as project sponsor. Tribal sponsorship and project funding by BPA was endorsed by all state and federal resource agencies interested in wild fish stocks and the stream.

A study was undertaken to determine the feasibility of rehabilitating anadromous salmonid habitat on patented land in upper Bear Valley Creek. The feasibility study determined which enhancement alternatives were available, which alternative was the most feasible after application of a set of criteria, and cost of the recommended alternative. just as sediment from the mine has affected fish habitat downstream, an enhancement effort to eliminate a sediment source near the headwaters of the stream will have an effect, over time, on fish and their habitats below the mine. Associated with the implementation of an enhancement effort was a task designed to evaluate effects of enhancement or treatment on the habitat and fish community throughout Bear Valley Creek. Baseline or pre-treatment data was collected in 1984.

Objectives of this study were: 1) to determine the feasibility of enhancing anadromous fish habitat in an inactive placer mine on upper Bear Valley Creek, Valley County, Idaho: and 2) to evaluate effects of habitat enhancement on the habitat and fish community in Bear Valley Creek.

STUDY AREA

Bear Valley Creek, located in Valley County, Idaho, joins with Marsh Creek to form the Middle Fork of the Salmon River (Fig. 1). Elk Creek is the largest tributary to Bear Valley Creek and is similar in size to Bear Valley Creek at their confluence. Other notable tributaries to Bear Valley Creek include Fir, Wyoming, Sack, Cache, and Casner creeks, none of which serve as substantial spawning or rearing areas for chinook salmon (Parkhurst 1950; Thurow 1985; Newberry and Corley 1984). Bear Valley Creek is a generally low gradient system which flows through sub-alpine (1970 m mean elevation) meadows and lodgepole pine (Pinus contorta) forests in a granitic batholith. Alluvial deposits of highly erosive sandy soils characterize the region.

Bear Valley Creek (54.5 km long) is located on Boise National Forest (48.2 km) and patented (6.3 km) lands. The feasibility study for enhancing salmonid habitat on the stream addressed 638 ha of patented land (Bear Valley Minerals, Inc., portions of Sections 10, 15, and 22, Township 11 North, Range 8 East, Boise Meridian) near the headwaters of the stream (Figs. 1 and 2, Appendix). Effects of the proposed habitat enhancement were evaluated on the entire length of Bear Valley Creek.

In the past, Bear Valley Creek provided spawning sites for a large number (1085 redds in 1956; Internal Report, Idaho Department of Fish and Game) of spring chinook salmon. A number of reasons, i.e. sedimentation of habitat, passage at Columbia River dams, have caused red counts to decline from lOOO+ redds per year to less than 60 redds per year, since the mid-1950's (Fig. 2). In addition to providing spawning sites, Bear Valley Creek is an important rearing stream for juvenile chinook salmon up to the pre-smolt stage. Other fish species present in Bear Valley Creek include Steelheas/rainboq trout (Salmo gairdneri),brook trout (Salvelinus fontinalis), bull trout (S. confluentus,), cutthroat trout (S. clarki), mountain whitefish (Prosopium williamsoni), and shorthead sculpin (Cottus confusus).

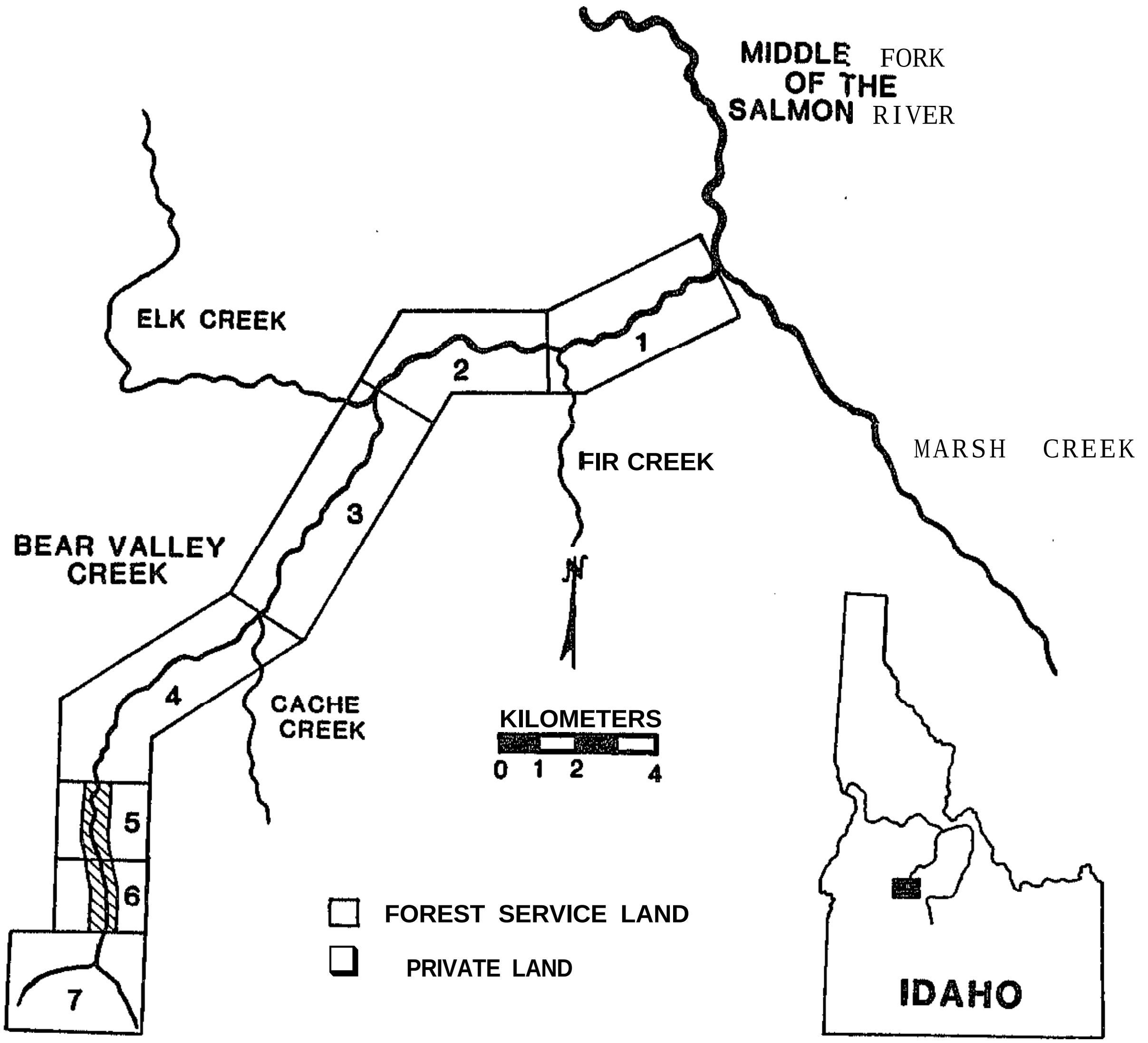


Figure 1. Sear Valley Creek, Idaho, study area and strata location.

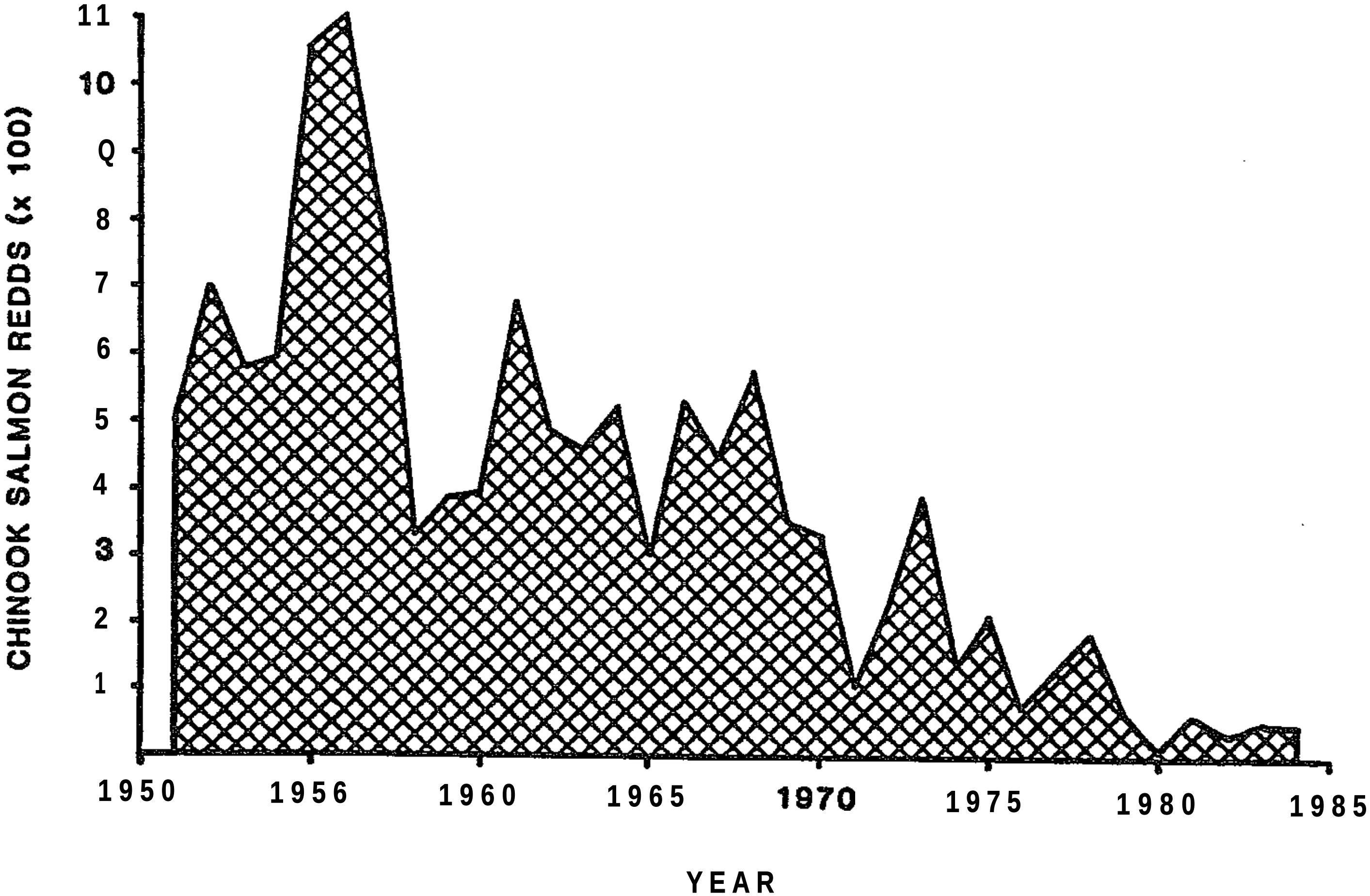


Figure 2. Counts of spring chinook salmon redds in Bear Valley Creek, Idaho, 1951-1984. Pre-1960 counts were made by walking.the stream while counts in later years were made from the air.

METHODS

Selection of Feasibility Study Subcontractor

Approximately 50 consulting firms, academic groups, and interested individuals were contacted, given an explanation of the general context of the overall project, and asked whether,or not they would be interested in responding to a request-for-proposal (RFP) for the Feasibility Study portion of the Bear Valley Creek Habitat Enhancement Project. Twenty-two firms expressed an interest in the RFP with a number of firms declining because of the late startup date during 1984 (July), the projected short turn-around time period (14 days), or not being able to supply the personnel (environmental engineer, hydraulic engineer, fisheries biologist, plant ecologist, hydrologist) from their company roles or as subcontractors that would be necessary to fulfill the statement-of-work. The RFP and eight amendments were sent to the 22 interested parties on 19 and 21 July, respectively. The'statement-of-work within the RFP contained introduction, technical scope, coordination/consultation, and report writing/completion schedule sections. The technical scope of the project was to devise a series of enhancement alternatives for the 4.5 linear kilometers of patented land (mined and unmined) that would be acceptable from standpoints of engineering feasibility and constructibility, reliability and effectiveness, implementation considerations, environmental effects, preliminary cost estimates, and the fulfillment of expectations of all interested parties. In addition, the RFP requested completed Standard Forms 254/255, a prospectus from each replying party, a further statement of company credentials and qualifications beyond the 254/255 level, and cost estimates (range) for the Feasibility Study. The Feasibility Study was designed to conclude with the final design of proposed alternatives to be implemented after endorsement by the Interagency Task Force, BPA, and private landowner. Implementation of any enhancement alternative was considered a later phase in the project.

Eleven firms responded with proposals. Awarding of the contract was based on: qualifications and experience of proposed personnel (30%), previous projects completed by party that were similar to the anticipated efforts on BVC (30%), general logistics (15%), projected cost (15%), and past involvement with proposed subcontractors (10%). James M. Montgomery, Consulting Engineers of Boise, Idaho were given the highest rating (9.25 of a possible 10; range: 4.75-9.25). Reasons for lower rankings included not addressing the statement-of-work, lack of qualifications, and a lack of general knowledge of the study area. After endorsement by the Interagency Task Force and negotiations involving BPA personnel, the Shoshone-Bannock Tribes awarded J.M. Montgomery the contract for the Feasibility Study for habitat enhancement on the patented land on 23 August.

Enhancement Feasibility Study

J.M. Montgomery, subcontractor for the Feasibility Study, conducted a data and literature search, analyzed the physical characteristics and erosion problems in the study area, formulated and developed components of enhancement alternatives, and used engineering and environmental criteria to produce a set of project alternatives which, with implementation, would fulfill the objectives of the enhancement project (Part 2, 1984 Annual Report, BPA Project No. 83-359).

Montgomery used the data and literature search to compile information about past studies on Bear Valley Creek and comparable streams in the area. Information and data collected on Bear Valley Creek was primarily qualitative but was sufficient to complete the Feasibility Study within stated assumptions. Literature compiled, catalogued, and used in alternative development included reports, articles, and personal communications on similar projects.

Data and information collected on Bear Valley Creek was used in the analysis.of the physical characteristics and erosion problems in the study area. A computer model which estimated design-event streamflows was used to analyze surface water hydrology. After determining the 1974 snowmelt runoff as an appropriate design-event, the model estimated that Bear Valley Creek and tributary watersheds within the study area yielded a peak flow of 17.5 m^3/second (616 ft3 /second). Groundwater flows of 0.6 to 0.8 m^3/second were estimated from limited stream guaging data. Four vegetation types were used to characterize plants in the study area. Erosion and sedimentation rates were estimated from USDA-U.S. Forest Service stream cross section data. Soils were described in terms of three main landtype associations recognized by the U.S. Forest Service. Geology and mineral resources were characterized from various government agency reports and information provided by Bear Valley Minerals, Inc. (landowner).

Upon completion of all data analyses, a set of evaluation criteria were used to systematically divide the study area into stream reaches and adjacent areas according to severity of erosion and associated problems. Problem stream reaches and adjacent areas were ranked and assigned a priority for development of enhancement components within preliminary alternatives for the patented land. Criteria used in the definition of a set of possible project alternatives and the eventual recommendation of an alternative for implementation (Part 3, 1984 Annual Report, BPA Project No. 83-359) were engineering feasibility and constructibility, reliability and effectiveness, implementation considerations, environmental effects, and preliminary cost estimates.

After examination of the feasibility study findings and the alternative that Montgomery selected for implementation, the landowners suggested an alternative (Part 4, 1984 Annual Report, BPA Project 83-359) which brought out their objectives in the project and future goals for their land' to a higher level than had occurred in Montgomery's selected alternative. The landowner identified a need to present the most environmentally conscious plan for stream realignment if mining became feasible at some future date. That realignment plan needed to be presented along with the enhancement plans to show engineering compatibility and feasibility. Costs for designing and constructing any realignment work would be borne by the landowner. Inclusion of the channel realignment plan within the preferred alternative would not constitute an endorsement of mining but, rather, would constitute the best plan, relative to the Interagency Task Force, for protecting the stream and fish populations if future mining was approved by agencies and legislatures (state and federal).

Enhancement Evaluation Study

Variables

Habitat and biological variables were collected during 1984 (pre-treatment) to evaluate proposed habitat enhancement on the patented land on upper Bear Valley,Creek, and subsequent effects on upstream (if any) and downstream areas. Two two-man teams measured variables and recorded data. Habitat variables measured were: water temperature, flow, riffle area, pool area, stream width, pool depth, gradient, embeddedness of pool substrate, riffle substrate, pool riparian cover, and channel substrate aggradation/degradation (Table 1). Biological variables measured were: species composition, relative abundance and densities of salmonid species, and length and weight of age 0+ chinook salmon (Table 1). Condition of age 0+ chinook salmon was calculated from length and weight data. Chinook salmon redd counts on Bear Valley Creek were obtained from Idaho Department of Fish and Game and were compared with numbers of age 0+ chinook salmon in August.

Both chinook salmon and steelhead trout utilize Bear Valley Creek for spawning and rearing purposes. However, collection of evaluation data for chinook salmon (age 0+ and 1* fish) was emphasized because: chinook salmon comprised most of the fish in Bear Valley Creek, past studies and redd counts on the stream for chinook salmon, paucity of existing information for steelhead trout on Bear Valley Creek and the difficulty in distinguishing between juvenile steelhead and rainbow trout. Additional data on steelhead/rainbow trout was collected, recorded, and filed from Bear Valley Creek in 1984 but the data was not analyzed for this report.

Variable Measurement

Stream length (km: total and by strata) was determined

Table 1. Habitat and biological variables monitored in Bear Valley Creek, Idaho, 1984.

Habitat	Biological (Fish)
Temperature	Species composition
Flow (discharge)	Relative abundance
Surface area	Density
Stream width	Population number
Stream depth	Length
Stream gradient	Weight
Riparian cover	Condition
Stream substrate	

from 7.5 minute series topographic maps (U.S. Geological Survey).

Water temperature (C) was monitored with two Taylor maximum/minimum thermometers in each stratum (lower and upper ends). Water temperature extremes from 8 August to 23 September were recorded for each stratum to determine if water temperature was a limiting factor relative to fish inhabitation.

Water velocities (m/second) and depth (m) were measured at one cross-section in each strata with a Marsh-McBirney flow meter and meter rod, respectively, to determine flows (cubic meters/second). Each cross section was located mid-strata in a run or tail of a pool.

Surface areas of riffles and pools were calculated from length and width measurements. Mean length (m) of riffles and pools were determined with tape measures or pacing each stream bank. Mean width (m) of riffles and pools were determined from a minimum of four systematic width measurements (water edge to water edge) in each riffle and Pool respectively. Maximum depth (m) was recorded in each width cross-section with a marked wading staff.

Riparian cover (cm) in pools was measured on each stream bank at a minimum of four systematically determined locations per bank. Riparian cover represented the extent to which shoreline vegetation (<90 cm height above water surface) and streambank extended over the water column. Riparian cover was analyzed as absolute or real cover (amount measured) extending over a pool from both banks and as a percent of stream width in a pool.

Percent of pool substrate that were fines (sand, silt, clay) was estimated visually. Larger substrate particles were assumed present at some depth but embedded by surface fines.

Riffle substrate particle sizes (mm) were measured at 25 equidistant points in each of three cross-sections on a riffle. Size measurements were categorized into phi particle size-classes from which size-frequency distributions were determined.

Stream gradient (%) was determined by measuring the change in water surface elevation on a 61 m section of stream near each site. Elevations were measured with a Wild auto level and Philadelphia rod.

Permanent cross sections, selected systematically within each stratum, were used to collect stream profile data for sedimenation/erosion rates. Cross sections were marked with 0.6 m rebar on each bank 0.5 m or more from the stream channel. Channel profile and water level were mapped using a Wild auto level, Philadelphia rod and tape measure. A minimum of 12 measurements were made between rebar stakes. Annual sedimentation/erosion rates will be estimated after measurements at permanent cross sections are obtained in subsequent years.

Fish were counted and lengths estimated of all salmonid species in each riffle-pool sequence by underwater snorkel observations. Fish numbers were categorized into age-classes determined from length-frequency distributions. Chinook salmon were differentiated into two groups: age 0+ fish and age 1+ residualized males. Steelhead trout (which were indistinguishable from rainbow trout) and brook trout were each separated into three groups: age 0+, age 1+ and age 2+ and older fish. Bull trout were differentiated into age 0+ and age 1+ and older fish. Cutthroat trout were noted but only considered as adults. Adult sea-run chinook salmon and shorthead sculpin were noted but not included in any analyses. Thus, a total of 14 species by age-class categories were defined for analyses. Relative abundance (%) was calculated as the number of fish in each class divided by the total number of fish present multiplied by 100. Density (number of fish/m pool) of each species class was calculated as the abundance of fish in each size-class divided by pool area.

Lengths (mm) and weights (0.01 g) of 0 to 40 age 0+ chinook salmon, collected via electrofishing (DC) and/or seining (10 mm mesh), were measured in each stratum. Salt was used to increase water conductivity and enhance electrofishing efficiency. Collected fish were anesthesized with MS-222 prior to measurement. Condition of age 0+ chinook salmon was calculated using length and weight data (Carlander 1979).

Experimental Design

Variables were measured in one riffle-pool sequence (experimental unit) at seven systematically determined sites (replicates or subsamples) within each of seven strata (plots) (Fig. 1). Stratification was based on stream size, valley width, gradient, land use, and land ownership (Table 2 and Fig. 3).

Habitat variables were measured once (August) and biological variables twice (August and September) during 1984 (Tables 3 and 4). A similar sampling scheme (split plot in time or repeated measure) will be utilized during 1985 and subsequent years, except sampling will take place during July and August. July sampling will be utilized because out-migration of age 0+ chinook salmon occur in early September. During post-treatment evaluations, the hypothesis of interest for habitat variables will be the interaction of strata between, and later among, years; for biological variables, the years x strata x times interaction will be the hypothesis of interest in later years.

Unless otherwise stated, main effect hypotheses were analyzed through a one-way analysis of variance (alpha=0.05) using a Statistical Analysis System (SAS) computer package (Helwig and Council 1979). Specific differences among strata were determined with Duncan's New Multiple Range Test (Ott 1977). Riffle substrate particle size distributions were compared between strata with the Chi Square Goodness of Fit

Table 2. Strata characteristics, Bear Valley Creek, Idaho.

Stratum	Length	Gradient	Land type	Land ownership	Land use
1[a]	7.7[b]	Medium	Narrow forested valley	USFS[c]	Non-consumptive
2	11.1	LOW	Wide valley, meadow/forest	USFS	Grazing[d]
3	12.7	LOW	Wide valley, meadow/forest	USFS	Grazing
4	11.2	LOW	Wide valley, meadow/forest	USFS	Grazing
5	4.0	LOW	Wide valley, meadow	BVY	Grazing
6	2.3	Medium	Wide valley, mine/meadow	BVM[e]	Mined (1950's)
7[f]	5.5	High	Narrow forested valley	USFS	Grazing, logging

a stream mouth.
b kilometers.
c U.S. Forest Service, Boise National Forest.
d three-year rest-rotation, two on and one off.
e Bear Valley Minerals, Inc., Denver, Colorado.
f stream headwaters.

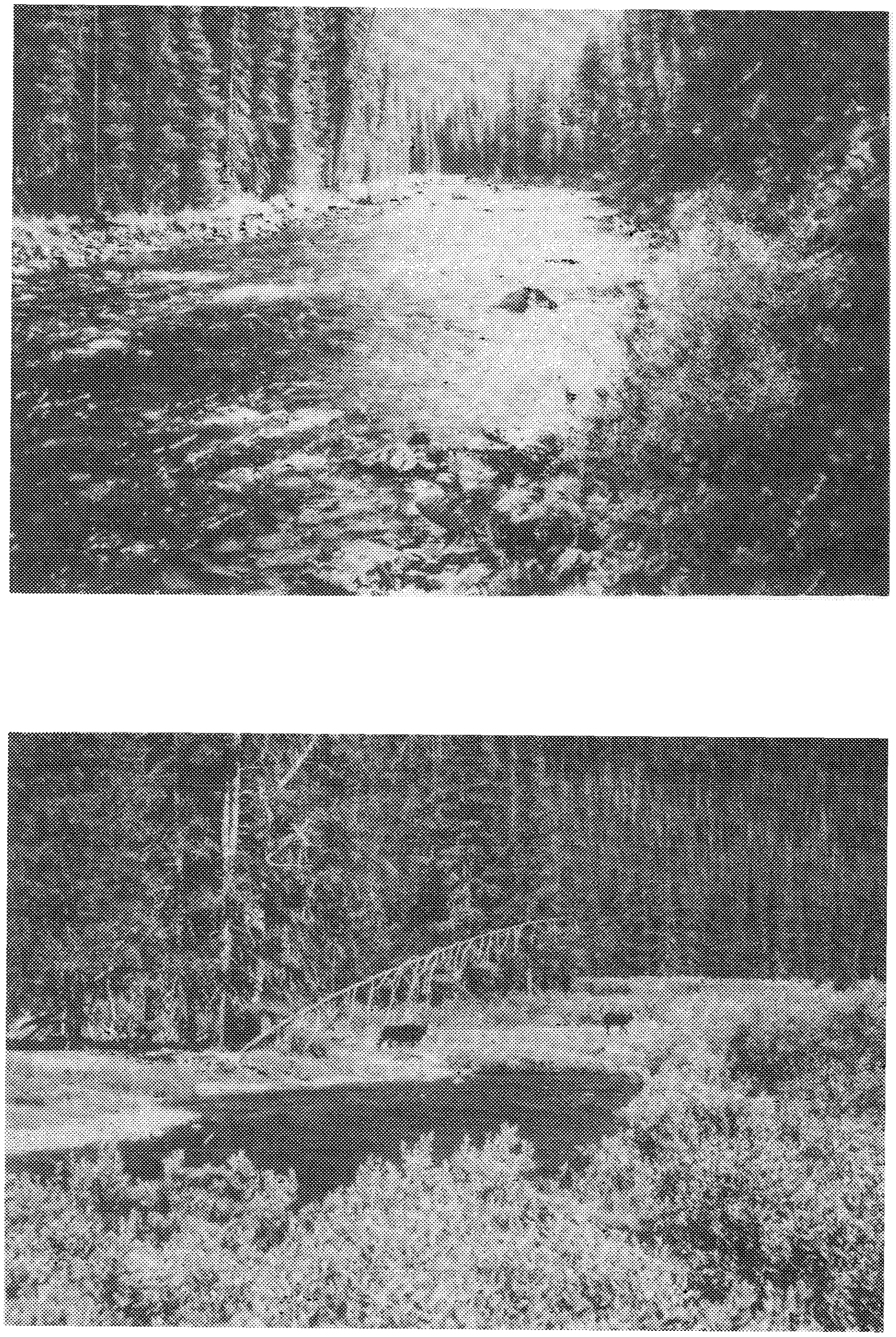
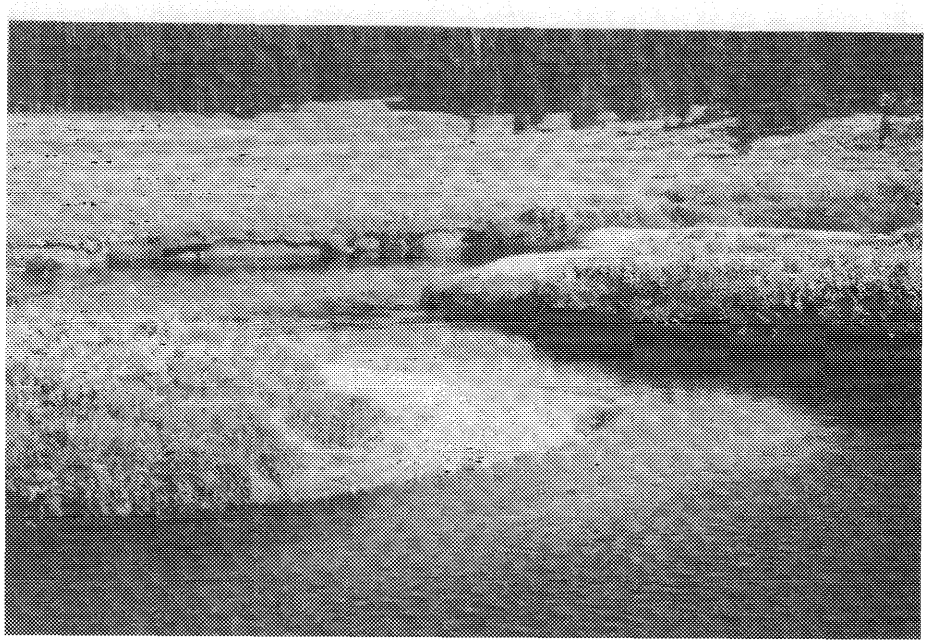
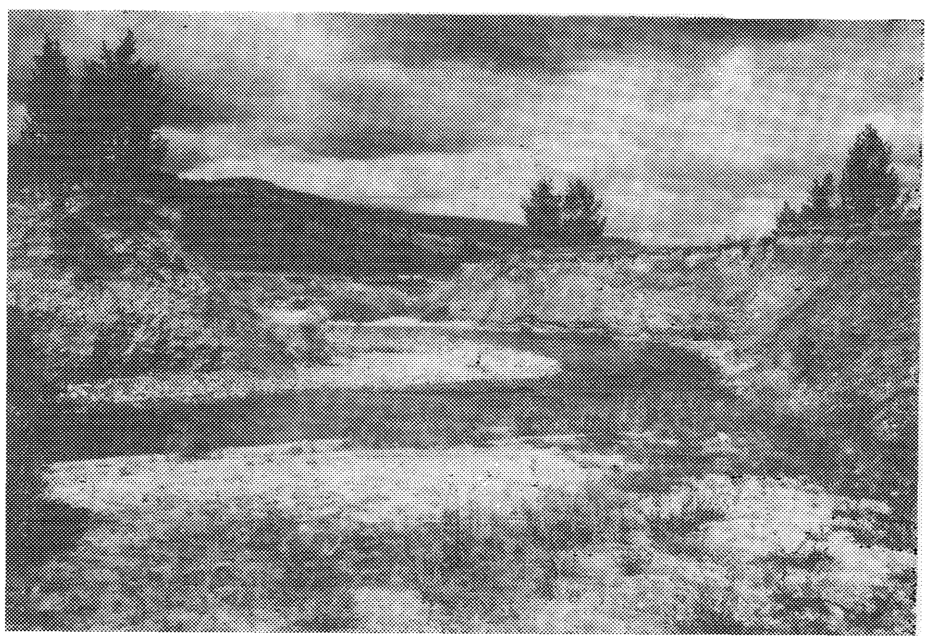


Figure 3. Typical reaches in study area strata, Bear Valley Creek, Idaho, 1984. Upper: stratum 1. Lower: strata 2, 3 and 4.





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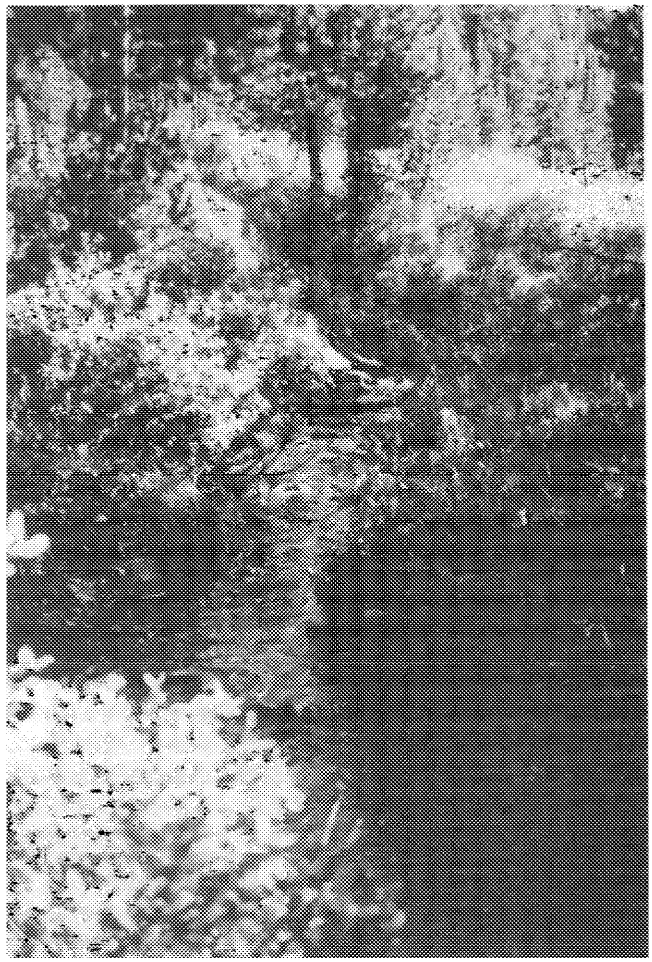


Figure 3. Continued. Stratum 7.

Table 3. Experimental designs, used in 1984 and proposed for 1985, for sampling habitat variables on Bear Valley Creek, Idaho.

Source	Degrees of freedom
1984	
7 Strata	6
7 Replicates (Stratum), Error A	42
TOTAL	48
1985	
7 Strata	6
7 Replicates (Stratum), Error A	42
2 Years	1
Years x Strata	6
Error B	42
TOTAL	97

Table 4. Experimental designs, used in 1984 and proposed for 1985, for sampling biological variables on Bear Valley Creek, Idaho.

Source	Degrees of freedom
1984	
7 Strata	6
7 Replicates (Stratum), Error A	42
2 Times per year	1
Times x strata	6
Error B	42
TOTAL	97
1985	
7 Strata	6
7 Replicates (Stratum), Error A	42
2 Times per year	1
Times x strata	6
Error B	42
2 Years	1
Years x strata	6
Years x times	1
Years x strata x times	6
Error C	84
TOTAL	195

Test (SAS). Significant interaction hypotheses required the calculation of least significant difference (LSD)(Steele and Torrie 1960) to delineate differences between/among and within interaction terms. Normality and homogeneity of variance were tested and appropriately transformed, when necessary, prior to using parametric statistics (Helwiq and Council 1979).

RESULTS

Enhancement Feasibility Study

Draft Feasibility Report

A Draft Feasibility Report (Part 2, 1984 Annual Report, BPA Project 83-359) presented procedures and analyses used to formulate preliminary enhancement alternatives which incorporated the objectives of the project and also identified critical information gaps on the Bear Valley Creek project site. A Final Feasibility Report was not delivered by J.M. Montgomery since the BPA Project Manager (Larry B. Everson) considered the number of corrections or modifications to the Draft insufficient to warrant a second document. Alternative components developed for the study area ranged from diversion of the stream around the mined area to stabilization of the stream channel in its existing alignment. Alternative components were initially screened for relative construction cost, engineering feasibility and constructability, implementation requirements, reliability, and effectiveness (Table 5). Five project alternatives resulted from the screening procedures, each providing an overall solution to the identified problems within the study area. A "no action alternative" (Project Alternative V) was briefly discussed and not considered further because the alternative did not fulfill project objectives.

Project Alternative I included the construction of a 4,760 m diversion channel through entire length of the patented land on Bear Valley Creek. Four primary components comprised Project Alternative I: a main diversion channel (divert Bear Valley Creek around all stream problem reaches through a stabilized channel and constructed floodplain), a west-side drainage channel, and stabilization/revegetation of two adjacent problem areas. Total preliminary cost estimate of Project Alternative I was approximately $18.6 million (all cost estimates in this report are Spring, 1985 dollars).

Project Alternative II included construction of a 2,800 m diversion channel through a portion of the patented land on Bear Valley Creek. Six primary components comprised Project Alternative II: a main diversion channel (divert Bear Valley Creek around three problem stream reaches through a stabilized channel and constructed floodplain), a west side drainage channel, and stabilization/revgetatin of two problem stream reaches and two adjacent problem areas. Total preliminary cost estimate of Project Alternative II was approximately $11.9 million.

Project Alternative III included construction of a 3,900 m diversion channel on the patented land. Four primary components comprised Alternative III: a main diversion channel (divert Bear Valley Creek around five problem stream reaches through a stabilized channel and constructed floodplain), a west side drainage channel, and stabilization/revegetation of two adjacent problem areas.

Table 5. Ratings by J.M. Montgomery of project alternatives developed (by Montgomery) within the feasibility study portion of the Rear Valley Creek fish habitat enhancement project.

Project alternative	Feasibility and constructability	Reliability and effectiveness	Implementation considerations	Environmental effects	Preliminary cost estimates	Total Point rating
I	1[a]	2	3	3	1	10[b]
II	2	2	3	3	2	12
III	2	2	3	3	1	11
IV	4	5	3	5	4	21
V	0	0	0	0	0	0

[a] point rating key; O=not acceptable; l=poor; 2=fair; 3=moderate: A-good; 5-excellent.

[b] total of ratings; O-25=possible range.

Total preliminary cost estimate of Project Alternative III was approximately $14.8 million.

Project Alternative IV included construction of a 670 m diversion channel and stabilization of the existing Bear Valley Creek channel through other selected areas on patented land. Seven primary components comprised Project Alternative IV: a diversion channel (divert Bear Valley Creek'around one problem stream reach through a stabilized channel and constructed floodplain), stabilization/revegetation of four problem stream reaches in the existing channel, and stabilization/revegetation of two adjacent problem areas. Total preliminary cost estimate of Project Alternative IV is approximately $3.8 million.

Selected Alternative Report

A Selected Alternative Report (Part 3, 1984 Annual Report, BPA Contract No. 83-359) presented a detailed description of the fish habitat enhancement alternative selected and recommended by J.M. Montgomery for the patented land on Bear Valley Creek. The selected alternative was initially described in the Feasibility Report as one (No. IV) of four project alternatives formulated to meet the objectives of the project. Suggestions from the Interagency Task Force included elimination of two problem stream reaches from implementation considerations in 1985. The Selected Alternative Report was prepared to: 1) 'provide a detailed description of the selected alternative; 2) discuss implementation of the selected alternative; 3) present construction considerations of the selected alternative: and 4) describe the livestock access plan.

Descriptions of six components that comprised the selected alternative were refined in the report. Schematic figures showing the improvements were also developed. Implementation considerations included a discussion of potential conflicts with future use of the patented land by Bear Valley Minerals, Inc. (landowner) and the acquisition of required permits for implementation. Construction considerations included estimates of construction quantities and assumptions, a preliminary cost estimate, a discussion of phasing construction, and construction schedule information. A livestock access plan described alternatives for different types of fencing, livestock crossings, and affects of the selected alternative on livestock operations. Total preliminary estimated cost of the selected alternative was $2.5 million.

Preferred Alternative Report

A Preferred Alternative Report (Part 4, 1984 Annual Report, BPA Project 83-359) presented a detailed description of: fish habitat enhancement up to and including the area around the access road to the U.S. Forest Sevice fire lookout; and, the plan for a main diversion channel and westside drainage runoff channel that would be built if mining would take polace at some future date. The preferred alternative was initially described in th Feasibility Report as the upstream portion of Alternative IV and the downstream portion of Alternative I. The Selected Alternative Report was prepared in order to: 1) provide a detailed description of te preferred alternative; 2) discuss permitting needs and implementation requirements for' the enhancement and the proposed diversion; 3) present construction considerations: and 4) describe the livestock access plan.

Description of the seven components that comprised the preferred alternative were refined in the report. Schematic figures which showed the location and effect of the enhancement and proposed diversion were also presented. Construction considerations were generally the same, although quantities differed, as those presented for the selected alternative. Total preliminary cost for the enhancement work was $2.5 million (funded by BPA) while cost of diverting the stream and building the diversion and drainage channels was $5.7 million (funded by Bear Valley Minerals, Inc.) if mining were to take [lace at some future date. Enhancement costs in the preferred alternative were lower than in the selected alternative because of the elimination of reaches below the access road. Given any monetary inflation, the cost of diversion will be conservative.

Habitat Inventory

Water temperature ranged from 0 to 19C during August and September (Table 6). Minimum temperatures ranged from 0 to 4C among strata. Maximum temperatures ranged from 13 to 19C among strata.

September flows in ranged from 13.2 m^3 in stratum 1 to 0.2 m^3 in stratum 6 and decreased exponentially from downstream to upstream strata (Fig. 4A). Flows were higher during August than September for all repeated samples (strata 4.5, and 6).

Riffle and pool areas differed ($F=68.3$; $P<0.0001$) among strata and generally decreased from downstream to upstream (Fig. 4B). Site (riffle plus pool) areas did not differ significantly between strata 1 and 2, while each were significantly larger than upstream strata. Site areas did not differ significantly between strata 3 and 4, while each were significantly larger than in upstream strata. Site areas in strata 5 and 6 did not differ significantly but were significantly larger than site area in stratum 7.

Pool widths differed ($F=73.8$, $P<0.0001$) among strata. Pool width ranged from 2.1 m in stratum 7 to 20 m in stratum 7 (Fig. SA). Widths did not differ significantly between strata 1 and 2; strata 3 and 4; or strata 5 and 6.

Maximum pool depth differed ($F=13.0$, $P< 0.0001$) among strata and ranged from 0.4 m stratum 7 to 1.6 m in stratum 2 (Fig. SB). Generally, maximum pool depth decreased from downstream to upstream except in stratum 5 where pools were

Table 6. Water temperature (C) extremes by stratum in Bear Valley Creek, Idaho from 8 August to 23 September?, 1985.

Stratum	Temperature (C)	
	Minimum	Maximum
1	3	13
2	4	1 9
3	1	16
4	0	14
5	0	18
6	0	17
7	0	13

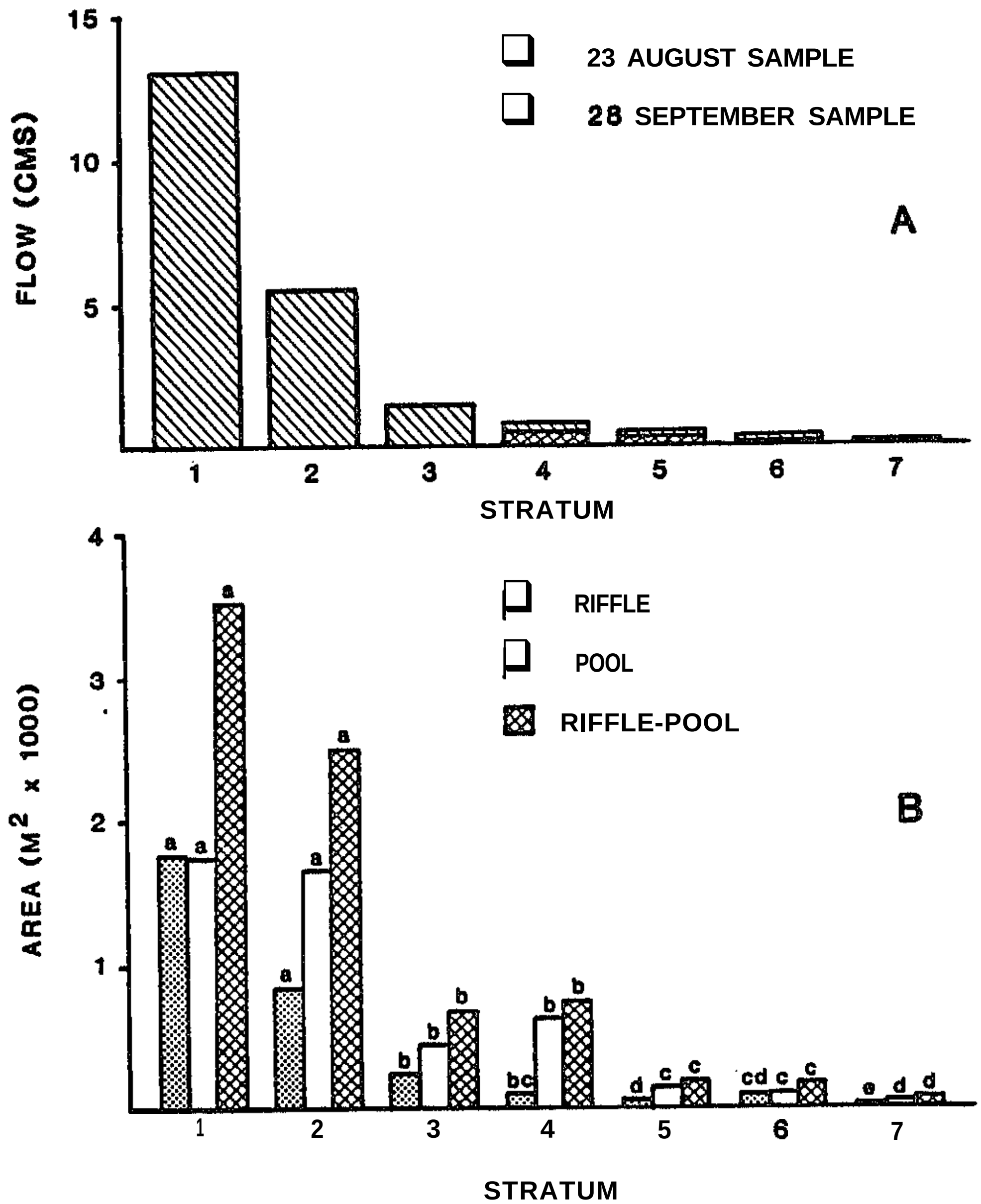


Figure 4. Flow (A) and mean (n=7 per stratum) riffle, pool and combined riffle-pool areas (B) by stratum, Bear Valley Creek, Idaho, 1984. A common letter above means indicate a non-significant (P>0.OS) difference among strata means.

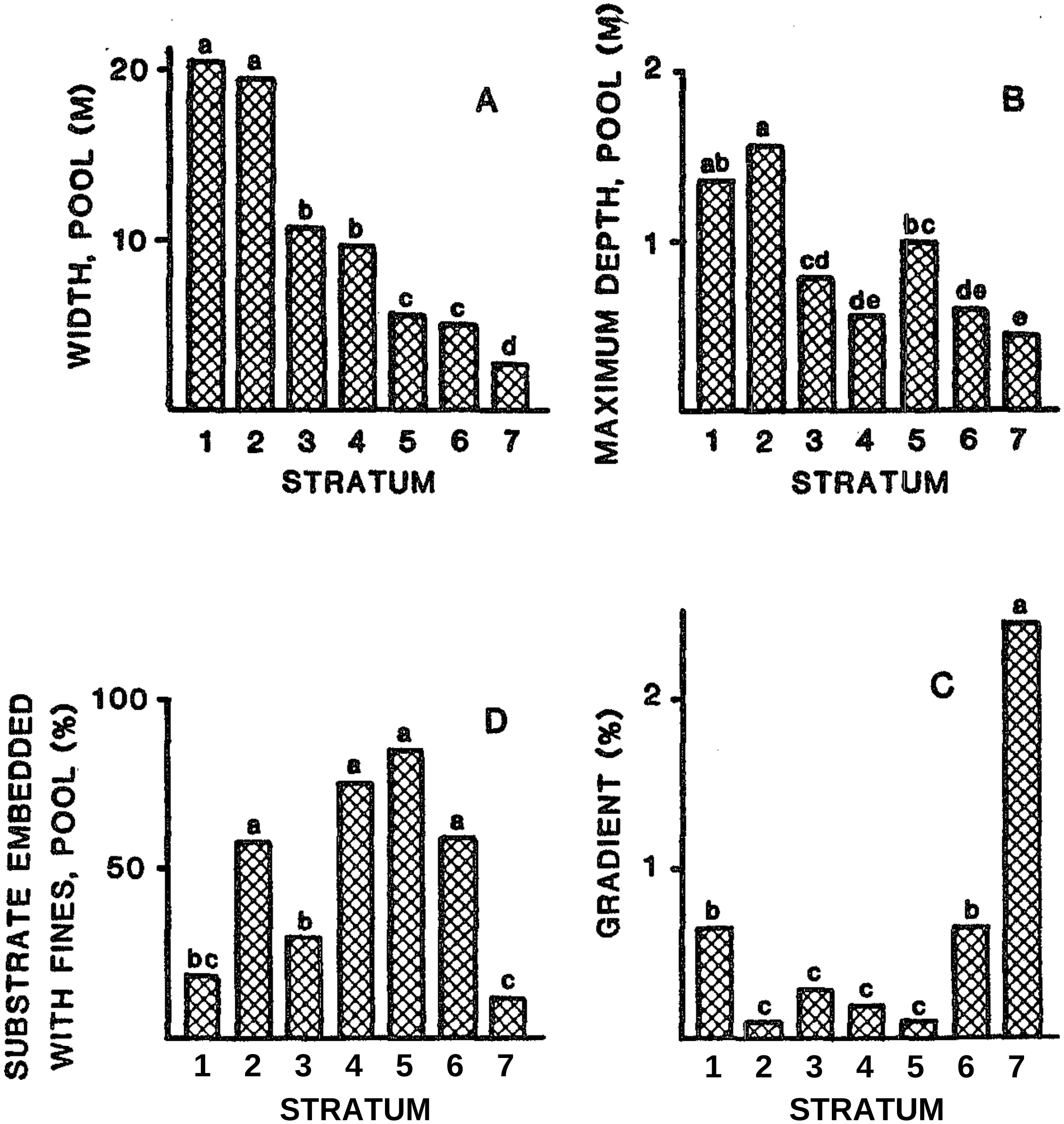


Figure 5. Mean (n=7 per stratum) pool width (A), maximum pool depth (B), gradient (C) and percent of pool substrate embedded with fines (D) by stratum, Bear Valley Creek, Idaho, 1984. A common letter above means indicate a non-significant (PaO.05) difference among strata means,

deeper than in adjacent strata.

Gradient differed ($F=15.1$, $P< 0.0001$) among strata and ranged from 0.1% in strata 2 and 5 to 2.5% in stratum 7 (Fig. 5C). Gradient in stratum 7 was significantly higher than in other strata. Gradient did not differ significantly between strata 1 and 6 or among strata 2,3,4 and 5. Gradients in strata 1 and 6 were significantly higher than gradients in strata 2 through 5.

The percent of pool bottom covered with fines (pools embeddedness) differed ($F=15.7$; $P<0.0001$) among strata and ranged from 12% in stratum 7 to 84% in stratum 5 (Fig. SD). Pool embeddedness did not differ significantly among strata 2, 4, 5 and 6, all of which were significantly higher than other strata. Pool embeddedness in stratum 3 was significantly higher than in stratum 7 but did not differ significantly stratum 1. Pool embeddedness in strata 1 and 7 did not differ significantly.

Size-frequency (%) distributions of riffle substrate particles differed ($Q=1257$; $P<0.0001$) among strata. Distributions differed significantly between all pairs of strata (Fig. 6). Highest frequency of large (> 128 mm diameter) riffle substrate occurred in strata 1 and 7. Highest frequency of small (<4 or <8 mm diameter) riffle substrate occurred in strata 2, 4, and 5 (Fig. 7).

Pool riparian cover differed significantly ($F=2.4$, $P<0.05$) among strata and ranged from 30 cm in stratum 6 to 87 cm in stratum 7 (Fig. 8). Riparian cover in stratum 7 had significantly more riparian cover than strata 2 or 6. Other strata did not differ significantly. Pool riparian cover, expressed as percent of stream width, differed significantly ($F=14.3$, $P<0.0001$) among strata and ranged from 2.7% in stratum 2 to 44% in stratum 7 (Fig. 8). Stratum 7 had significantly higher riparian cover (%) than other strata. Strata 4 and 5 had significantly higher riparian cover than strata 1, 2 or 3 but did not differ significantly from stratum 6.

Fish Community Inventory

Total Density and Relative Abundance

Fish densities (all species combined) were higher upstream (strata 4 to 7) than downstream (strata 1 to 3) strata during August (Fig. 9). Fish densities decreased in upstream strata between August and September and resulted in similar fish densities among strata during September.

During August, relative abundance of age 0+ chinook salmon ranged, by strata, from 25 to 78% (Fig. 9). Age 0+ chinook salmon was the most abundant species-age class in all strata exept stratum 2, where adult mountain whitefish were most abundant. Relative abundance of other species-age classes were low (<12%) in upstream strata during August. Relative abundances of age 0+ steelhead/rainbow trout and adult mountain whitefish were high in strata 2 and 3 (>17%)

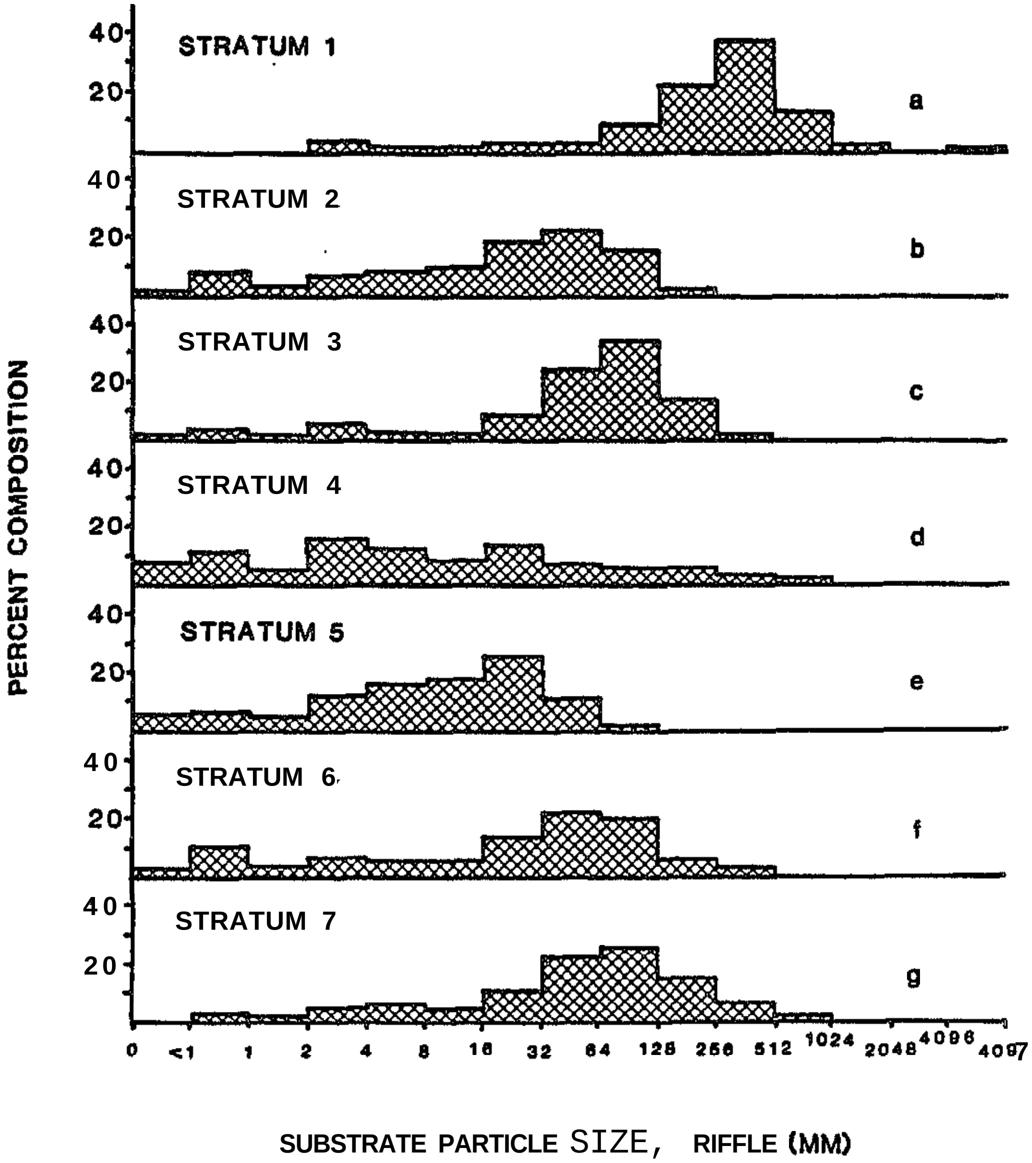


Figure 6. Mean (n=7 per stratum) distributions of substrate particle sizes in riffles by stratum, Bear Valley Creek! Idaho, 1984. A common letter next to distributions indicate a non-significant (~>0.05) difference between distributions.

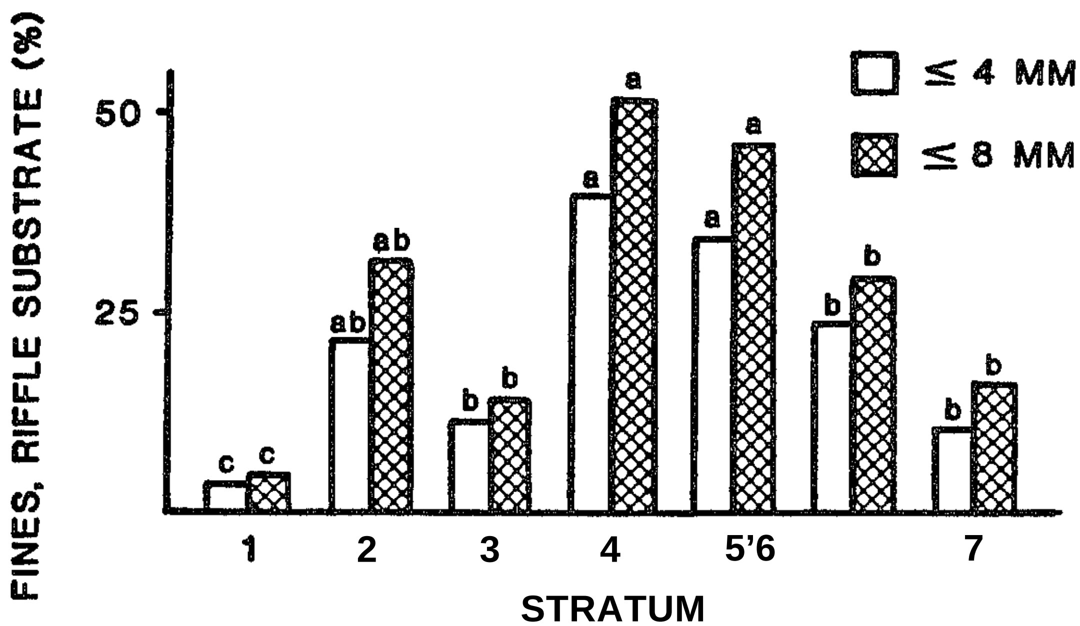


Figure 7. Mean (n=7 per stratum) percent of riffle substrate particles less than or equal to 4 and 8 mm diameter by stratum, Bear Valley Creek, Idaho, 1984. A common letter above means indicate a non-significant (P>0.OS) difference among strata means for each size class.

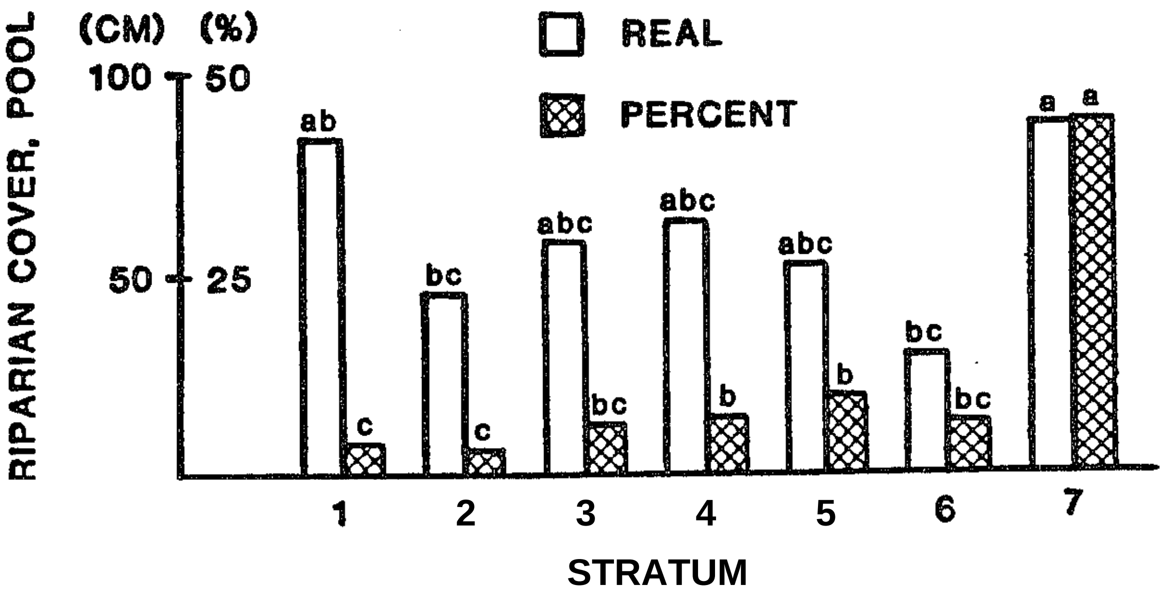


Figure 8. Mean (n=7 per stratum) riparian cover (real or measured and percent of pool width) by stratum, Bear Valley Creek, Idaho, 1984. A common letter above means indicate a non-significant (P>O.OS) difference among strata means within each method of measurement.

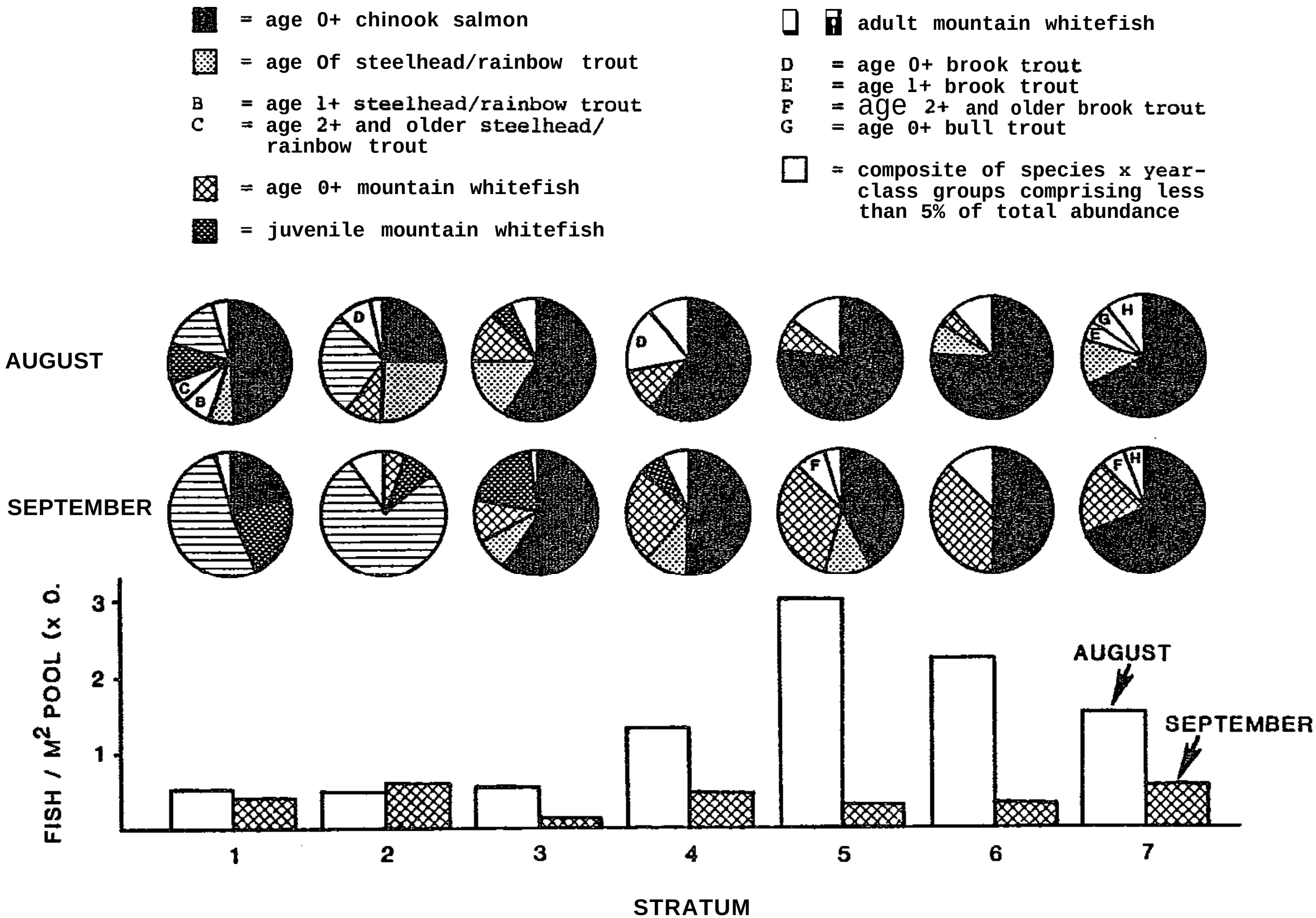


Figure 9. Mean (n=7 per stratum) fish densities'of all species and age-classes (histogram) and relative abundance of species by age-classes (pie-charts) by stratum and month, Bear Valley Creek, Idaho, 1984.

and strata 1 and 2 (>15%), respectively.

During September, relative abundance of age 0+ chinook salmon ranged, by strata, from 0 to 69% (Fig. 9). Relative abundance of age 0+ chinook salmon during September was higher than other age-classes of species in all strata except mountain whitefish which were more abundant in strata 1 and 2 (>53%). Relative abundance of age 0+ and juvenile whitefish were high in strata 4, 5, 6, and 7 (>19%) and strata 1 and 3, respectively.

Densities

Age 0+ chinook salmon. Densities differed (F=5.7, P=O.O002) among strata by months (interaction). Densities ranged from 0.02 to 0.31 fish/m^2 pool among strata in August and from 0 to 0.08 fish/m^2 pool among strata in September (Fig. lOA). In August, densities were significantly higher in. strata 5 and 6 than other strata. Densities did not differ significantly between strata 5 and 6 and among strata 1, 2, 3, 4, and 7. In September, densities did not differ significantly among strata. Densities in strata 5 and 6 were significantly higher in August than September whereas densities in the other strata did not differ between months.

Age l+ chinook salmon. Densities differed (F=2.8, P=O.O2) among strata by months (interaction). Densities ranged from 0 to 0.008 fish/m^2 pool in August (Fig. 10B). No age 1+ chinook salmon were observed in September. Fish density was significantly higher in stratum 5 than in other 'strata. Densities in strata other than stratum 5 did not differ significantly.

Age 0+ steelhead/rainbow trout. Densities differed (F=8.7, P=O.OO5) between August (0.01 fish/m^2 pool) and September (0.003 fish/m* pool) (Fig.11 A). Densities (range: 0.002 to 0.01 fish/m^2 pool) did not differ (F=0.8, P=O.601 among strata.

Age l+ steelhead/rainbow trout. Densities differed (F=3.0, P=O.O2) amonq strata and ranged from 0 fish/m^2 pool in strata 5 and 7 to-O.003 fish/m^2 pool in stratum 1 (Fig. 11B). Densities also differed (F=12.7, P=O.OOO9) between August (0.002 fish/m^2 pool) and September (0.00006 fish/m^2 pool) (Fig. 11C)

Age 2+ and older steelhead/rainbow trout. Densities differed (F=2.66, P=O.O3) among strata by months (interaction). Densities ranged from 0 to 0.003 fish/m^2 pool in August and from 0 to 0.0009 fish/m^2 pool in September (Fig. 12A). During August, densities were significantly higher in stratum 1 than other strata; densities did not differ significantly between strata 2 and 5; densities in strata 2 and 5 were signifcantly higher than in other strata. Densities did not differ signifcantly among strata in September. Densities were significantly higher in strata 1, 2, and 5 in Auqust than in September.

Age 0+ brook trout. Densities differed (F=5.3, P=O.O27) between August (0.004 fish/m^2 pool) and September (0.001

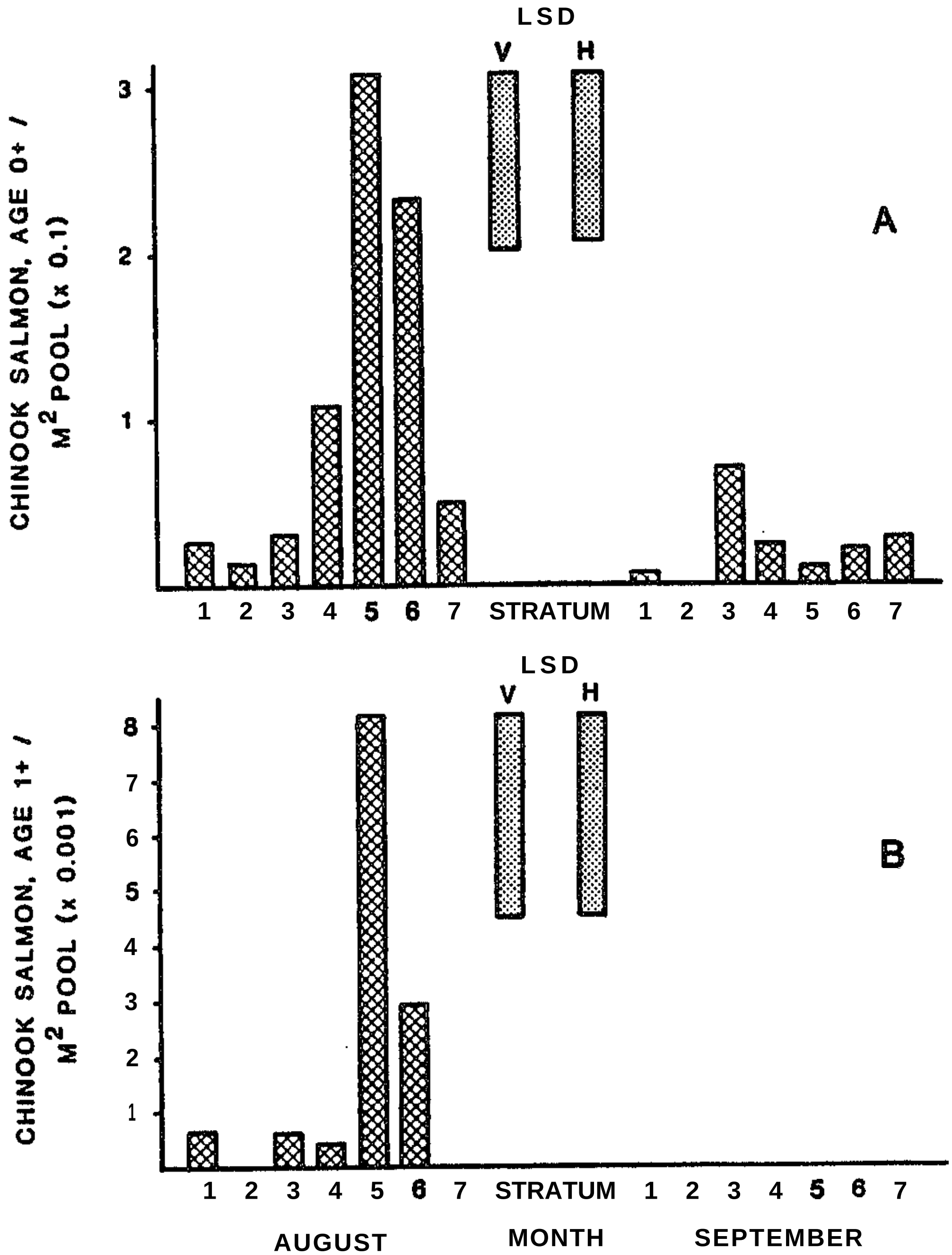


Figure 10. Mean (n=7 per stratum) densities of age 0+ (A) and age l+ (B) chinook salmon by stratum, Bear Valley Creek, Idaho, during August and September, 1984. Mean differences within or between months that are greater than vertical (V) or horizontal (H) LSD's, respectively, indicate significant (P 5 0.05) differences between those means.

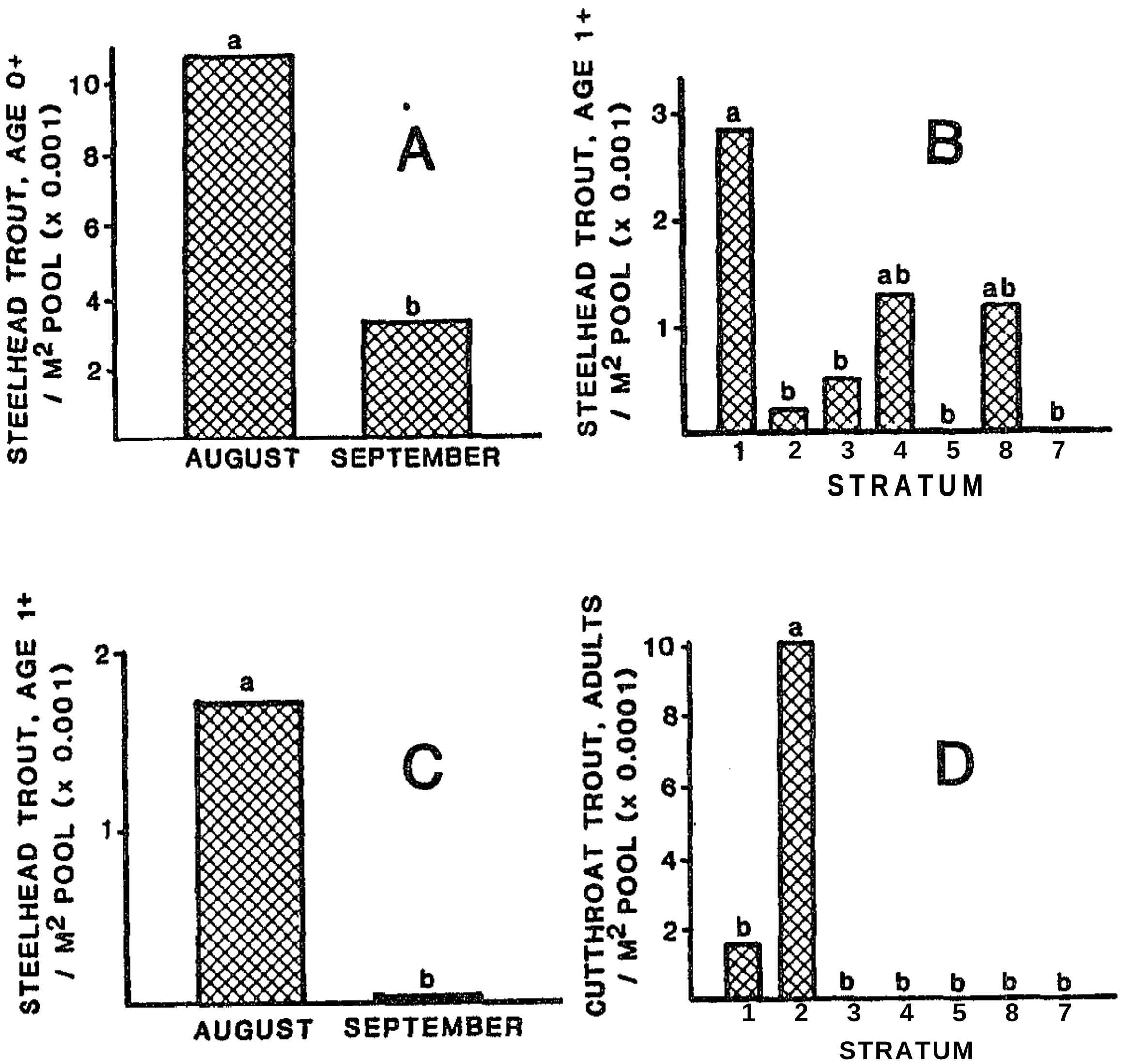
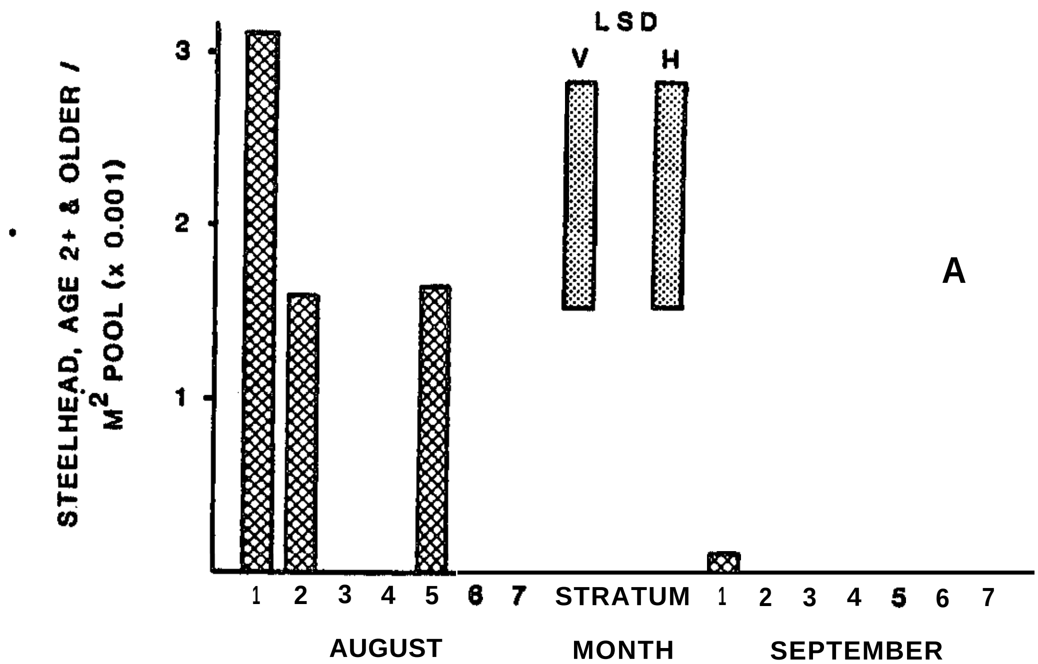


Figure 11. Mean (n=7 per stratum) densities of age 0+ (A) and age l+ (B and C) steelhead/rainbow trout and adult cutthroat trout (D) by stratum and/or month, Bear Valley Creek, Idaho, 1984. A common letter above means indicate a non-significant (P>0.05) difference among strata or month means.



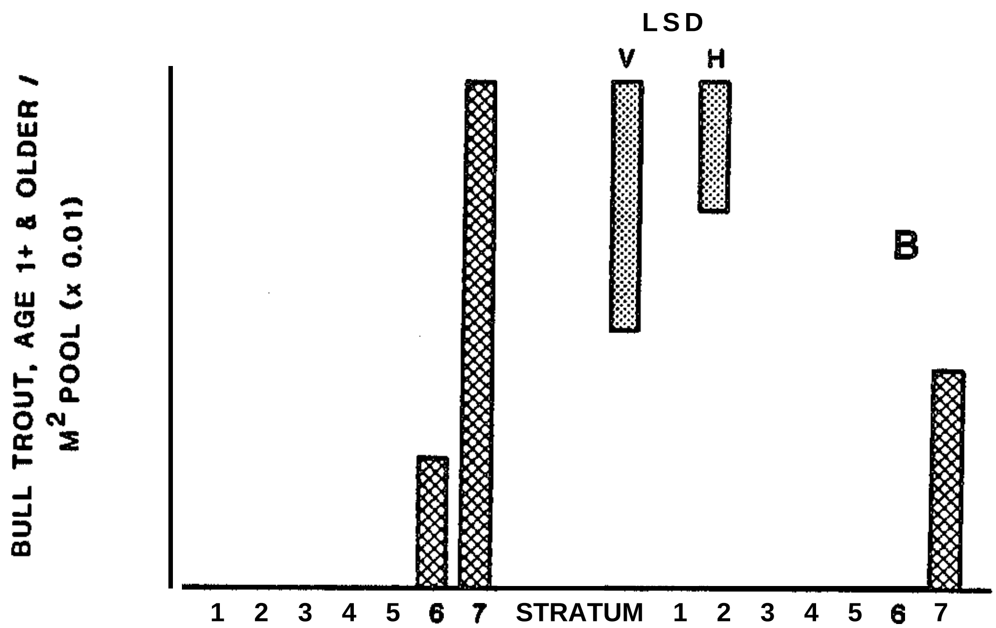


Figure 12. Mean (n=7 per stratum) densities of age 2+ and older steelhead/rainbow trout (A), and age I+ and older bull trout (B), Bear Valley Creek, Idaho, 1984. Mean differences within or between months that are greater than vertical (v) or horizontal (H) LSD's, respectively, indicate significant (P 5 0.05) differences between those means.

fish/m² pool) (Fig. 13A). Densities (range: 0 to 0.008 fish/m^2 pool) did not differ (F=2.2, P=0.06) among strata.

Age l+ brook trout. Densities differed (F=5.0, P=0.03) between August (0.003 fish/m^2 pool) and September (0.0002 fish/m^2 pool) (Fig. 13B). Densities (range: 0 to 0.005 fish/m* pool) did not differ (F=l.l, P=O.40) among strata.

Age 2+ and older brook trout. Densities differed (F=4.4, P=O.OOZ) among strata and ranged from 0 fish/m^2 pool in strata 2 and 6 to 0.005 fish/m^2 pool in stratum 5 (Fig. 13C). Densities in stratum 5 were significantly higher than in other strata. Densities in strata other than stratum 5 did not differ significantly. Densities did not differ (F=0.07, P=0.80) between August (0.001 fish/m^2 pool) and September (0.0009 fish/m^2 pool).

Age 0+ bull trout. Densities did not differ (F=1.7, P=O.14) among strata and ranged from 0 fish/m^2 pool in strata 1, 2, 3, 4, and 5 to 0.005 fish/m^2 pool in stratum 6. Densities did not differ (F=l.O, P=0.07) between August (0 fish/m' pool) and September (0.002 fish/m^2 pool).

Age l+ and older bull trout. Densities differed (F=5.68, P=O.02) among strata bv months (interaction). Densities ranged from-0 to 0.022 fish/m^2 pool in August and from 0 to 0.0.01 fish/m^2 pool in September (Fig. 12B). Density in stratum in stratum 7 were significantly higher than in other strata in both August and September. Densities in stratum 7 were higher in August than in September.

Adult cutthroat trout. Densities differed (F=3.6, P=O.OOOl) among strata and ranged from 0 fish/m* pool in strata 3, 4, 5, 6, and 7 to 0.001 fish/m^2 pool in stratum 2 (Fig. 11D). Densities in stratum 2 were significantly higher than in the other strata. Densities in strata other than stratum 2 did not differ significantly. Densities did not differ (F=0.9, P=0.36) between August (0.0001 fish/m^2 pool) and September (0.0002 fish/m^2 pool). No young-of-year or juvenile cutthroat trout were observed in Bear Valley Creek in either August or September.

Age 0+ mountain whitefish. Densities differed (F=2.8, P=0.022) among strata and ranged from 0.001 fish/m^2 pool in stratum 1 to 0.02 fish/m^2 pool in stratum 5 (Fig. 13D). Densities in strata 4 and 5 were significantly higher than in strata 1, 2, and 7. Densities did not differ significantly among strata 1, 2, 3, 6, and 7 or among strata 3, 4, 5, and 6. Densities did not differ (F=3.3, P=0.08) between August (0.01 fish/m^2 pool) and September (0.008 fish/m^2 pool).

Juvenile mountain whitefish. Densities differed (F=3.9, P=O.OO4) among strata by months (interaction). Densities ranged from 0 to 0.01 fish/m^2 pool in August and from 0 to 0.03 fish/m^2 pool in September (Fig. 14A). In August, densities in stratum 5 were significantly higher than in strata 6 or 7 but did not differ signifcantly from densities in strata 1, 2, 3, and 4. In September, densities in stratum 3 were significantly higher than in other strata; densities were significantly higher in stratum 1 than in strata 2, 4,

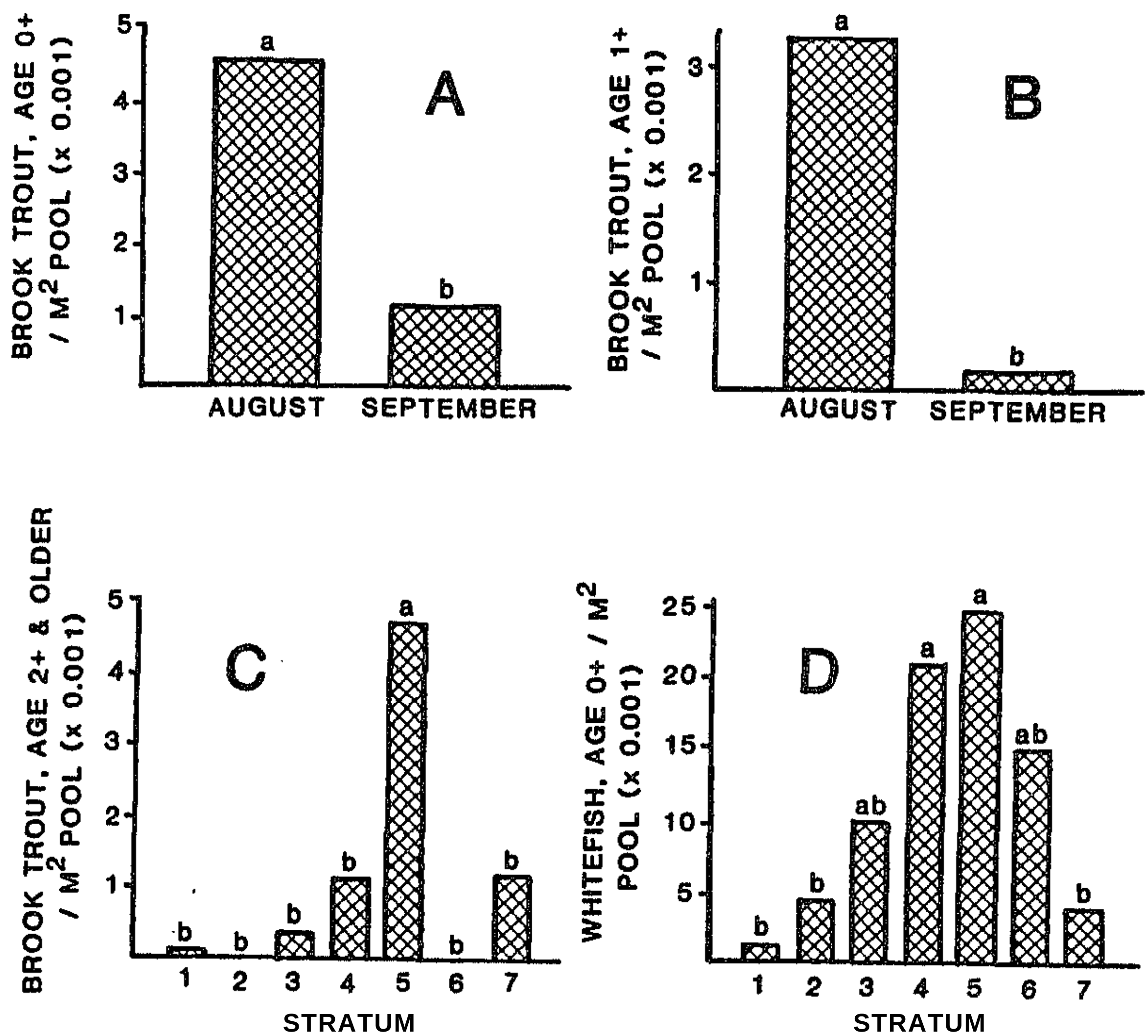


Figure 13. Mean (n=7 per stratum) densities of age 0+ (A), age l+ (B), and age 2+ and older (C) brook trout and age 0+ whitefish (D) by stratum or month, Bear Valley Creek, Idaho, 1984. A common letter above means indicate a non-significant (P>0.05) difference among strata or month means.

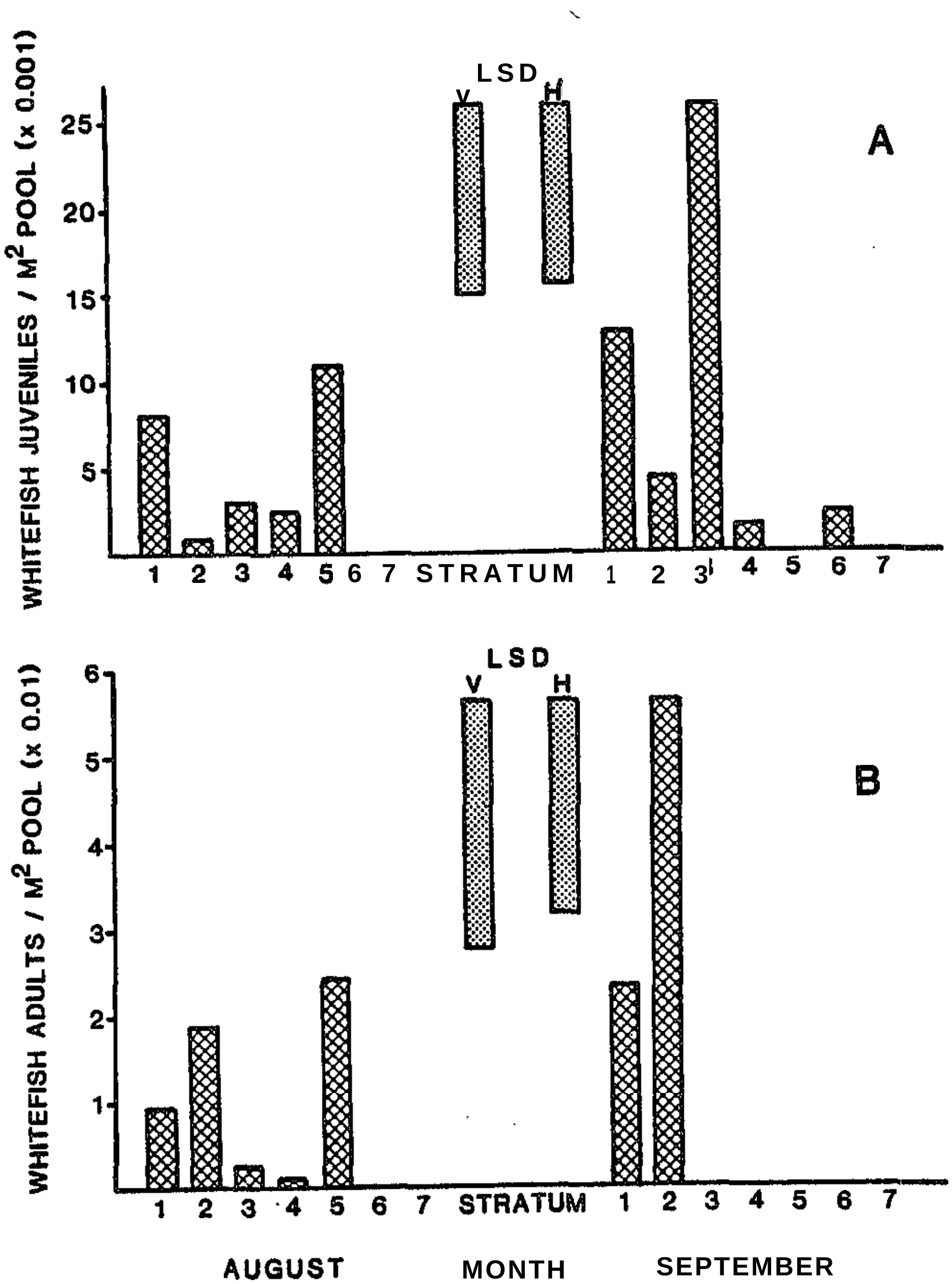


Figure 14. Mean (n=7 per stratum) densities of juvenile (A) and adult (B) whitefish, Bear Valley Creek, Idaho, 1984. Mean differences within or between months that are greater than vertical (V) or horizontal (H) LSD's, respectively, indicate significant (P 5 0.05) differences between those means.

5, 6, and 7. Densities in stratum 3 were significantly lower in August than in September. Densities in stratum 5 were significantly higher in August than in September. Densities in strata other than 3 and 5 did not differ significantly between August and September.

Adult mountain whitefish. Densities differed ($F=2.32$, $P=0.0499$) among strata by months (interaction). Densities ranged from 0 to 0.02 fish/m^2 pool in August and 0 to 0.06 fish/m^2 pool in September (Fig. 14Bj. Densities did not differ significantly among strata in August. In September, densities in stratum 2 were significantly higher than in other strata. Densities in stratum 2 were significantly lower in August than in September. Densities in strata other than stratum 2 did not differ significantly between August and September.

Age O+ Chinook Salmon

Total length. Fish length differed among strata ($F=17.3$, $P=0.003$) and ransed from 68 to 85 mm (Fia. 15). Fish lengths in strata l, 2, 3, and 4 (downstream; were significantly longer than in strata 5, 6, and 7 (upstream). Fish length also differed ($F=8.8$, $P=0.03$) between August (75 mm) and September (83mm).

Live weight. Fish weight differed ($F=13.3$, $P=0.006$) among strata and ranged from 2.6 to 6.0 q/fish (Fig. 15). Fish weight in strata 1 and 2 was significantly higher than in strata 5, 6, and 7. Fish weight did not differ ($F=3.5$, $P=0.12$) between August (3.7 q) and September (4.6 g).

Condition. Fish condition differed among strata ($F=8.9$, $P=0.0lS$) and ranged from 0.82 to 0.94 (Fig. 15). Fish condition in strata 1 and 2 were significantly higher than in strata 3, 4, 6, and 7. Fish condition differed ($F=10.3$, $P=0.024$) between August (0.86) and September (0.88).

Abundance. Total number of fish in August was 18,100 + 4,093 (95% bounds) (Fig. 16 and Table 7). Highest numbers - (4,610 z 1,263) were observed in stratum 5. Lowest numbers (938 + 69) were observed in stratum 7. A majority (51%) of fish.were found in strata where previous redd counts (Idaho Department of Fish and Game) have not been made in the past (Fig. 17). A total of 56 redds were counted in strata 2,3, and 4 in 1983.

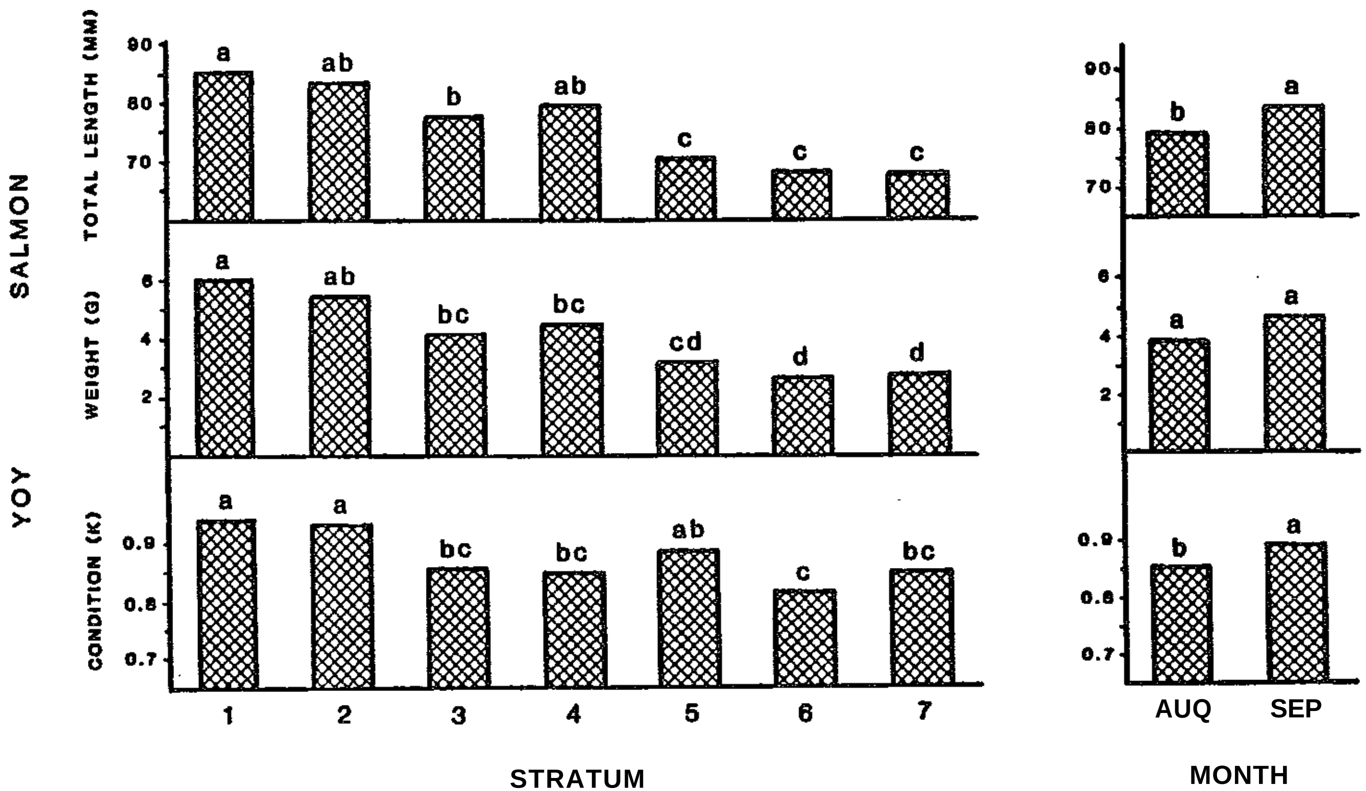


Figure 15. Mean total length, weight, and condition of age 0+ chinook salmon by stratum (left) and month (right), Bear Valley Creek, Idaho, 1984. A common letter above means indicate a non-significant (P20.05) difference among strata or month means.

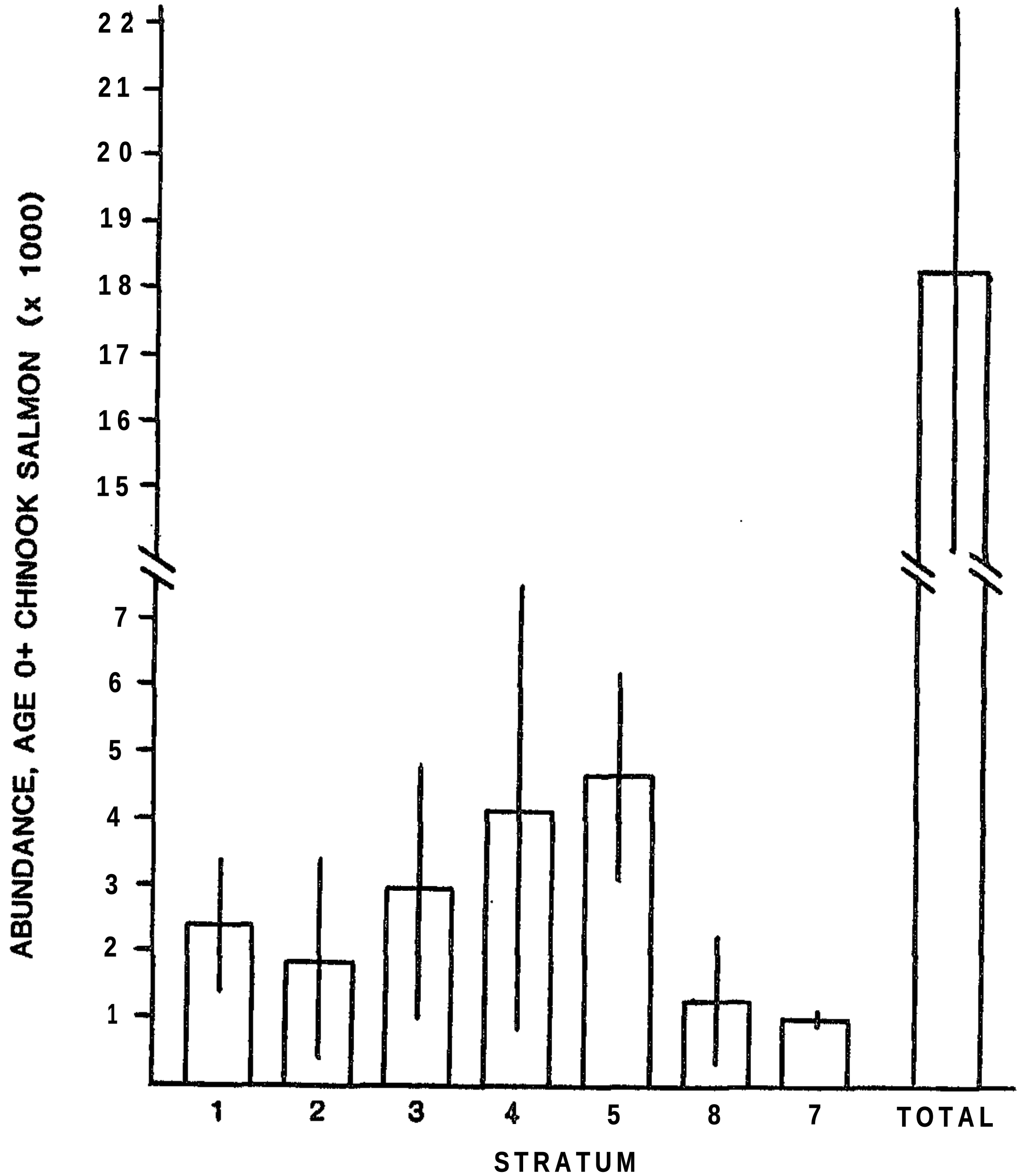


Figure 16. Estimated abundance of age 0* chinook salmon by stratum and for the entire stream, Bear Valley Creek, Idaho, during August, 1984. Vertical lines represent 95% confidence intervals.

Table 7. Abundance and associated 95% bounds of age 0+ chinook salmon in strata of Bear Valley.Creek, Idaho, 1984.

Stratum		Abundance		
Number	Leneth (km)	Estimate	Bounds	Percent of total
1	7.7	2409	1544-3274	13
2	11.1	1808	3176-3176	10
3	12.7	2894	12954489	16
4	11.2	4144	1319-6969	23
5	4.0	4610	3347-5873	26
6	2.3	1226	403-2049	7
7	5.5	938	869-1007	5
Totals	54.5	18,100	14,007-22,193	100

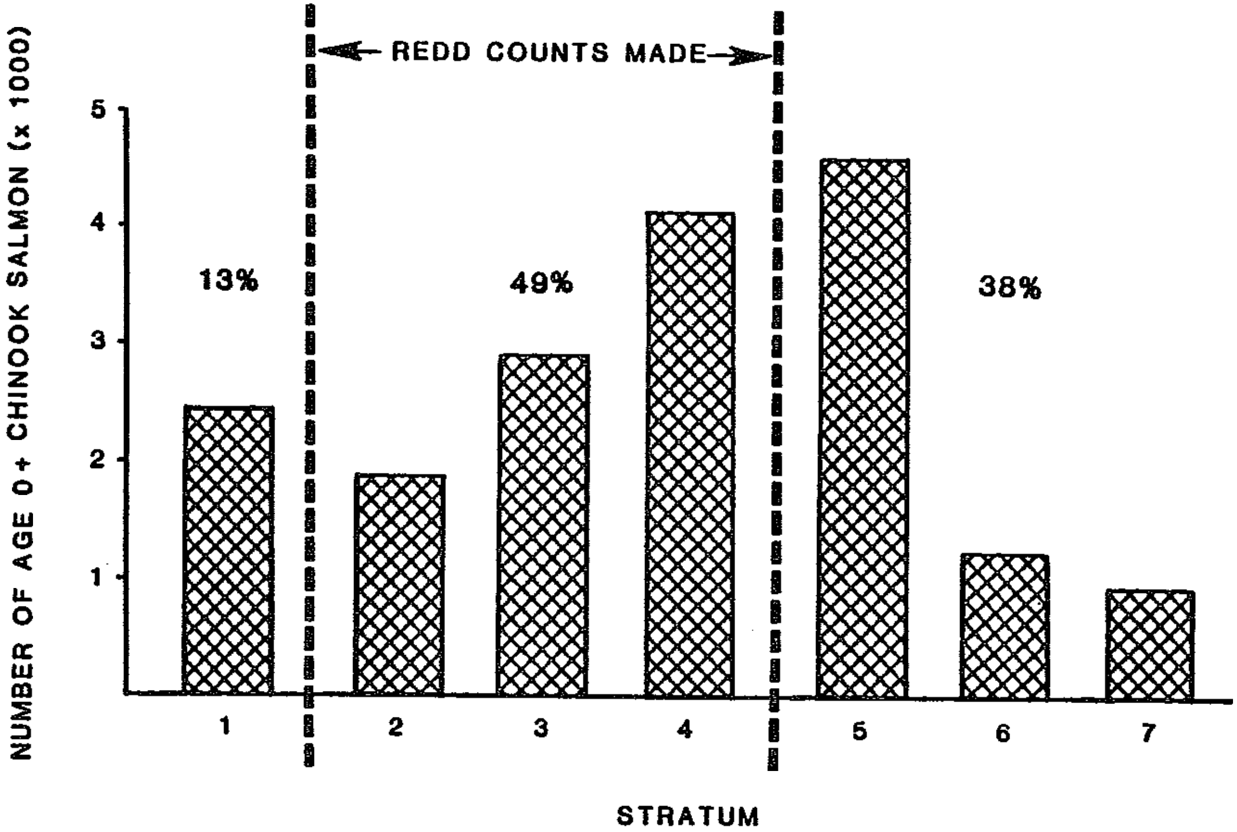


Figure 17. Strata in which redd counts have been historically made in Bear Valley Creek, Idaho, and the percent occurrence (sum of fry numbers downstream, within, and upstream of redd counts divided by total fry numbers) of chinook salmon fry in the stream in August, 1984.

DISCUSSION

Enhancement Feasibility Study

A Feasibility Report (Part 2, Annual Report, BPA Project 83-359), produced by the engineering subcontractor (J.M. Montgomery, Boise, Idaho) on the project, concluded that five alternatives could eliminate the sediment problems which originate in the placer-mined area of upper Bear Valley Creek. Alternative V, a "no action" alternative which allowed for a long-term natural flushing of sediment from the stream was eliminated from further consideration because the measure did not meet project objectives. Montgomery ranked the other four alternatives and found Alternative IV to be the most feasible from the standpoints of constructability, reliability, implementation considerations, environmental effects, and cost ($3.8 million). Alternatives I was very costly ($18.6 million) and was the least feasible for construction. Alternatives II and III were also costly ($11.9 and 14.8 million, respectively) and neither could be constructed as feasibly as Alternative IV.

The Interagency Task Force on the project met in Boise on 2 April 1985 to discuss and comment on the Feasibility Report. At the meeting, Montgomery presented Feasibility Study findings and data that substantiated their selection of Alternative IV as the most feasible solution to the sediment problems in the upper areas of the stream. After a discussion by the Task Force members and the subcontractor representatives, the agency personnel endorsed Alternative IV as the selected alternative for implementation except for stream reaches B and I. Measures proposed for the enhancement of reaches B and I were not acceptable to a number of Task Force members. Enhancement measures proposed by the subcontractor for reaches B and I will be compared with suggestions by the Task Force during a walkthrough of the entire project site on 28 June 1985. Montgomery was charged with producing a "selected" alternative document by May, 1985.

A Selected Alternative Report (Part 3, Annual Report, BPA Project 83-359) was produced by Montgomery and distributed to BPA, Shoshone-Bannock Tribes, and landowner representatives on 26 April 1985 for review. The Report included enhancement measures for all problem reaches and adjacent areas near the stream with the exception of reaches B and I. Deleting enhancement measures for the two reaches and a further fine-tuning of enhancement costs reduced the cost of the Selected Alternative to $2.5 million. Representatives of the Tribes and Montgomery planned a 10 May 1985 meeting with landowner representatives to determine if the Selected Alternative Report, the proposed and endorsed enhancement approach, was acceptable to the landowner. If not acceptable, another approach was to be formulated at the meeting that was acceptable to the landowner, feasible from the engineering subcontractors viewpoint, and could be funded by BPA and/or the landowner.

During the 10 May 1985 meeting, representatives of Bear Valley Minerals, Inc. of Denver, Colorado, owners of the private land, would not accept the Selected Alternative Report (Altertive IV as endorsed by the Interagency Task Force) as their choice for implementation. A given reason for not accepting the Selected Alternative for implementation was that plans for such construction did not recognize the landowners objectives in the project and might have hampered the landowners future plans on their land. Based on that reasoning and in preference to the Selected Alternative, the landowner representatives suggested a composite of portions of Alternatives I and IV (from the Feasibility Report) as their "preferred" alternative that could be implemented (they would sign a construction easement for). Although the landowners have granted the project an access easement to their property for the Feasibility and Evaluation Studies, a construction easement is necessary before any implementation can take place on the private land.

The Preferred Alternative, as proposed by the landowners, differed from the Selected Alternative in two major areas: first, the enhancement effort would be limited to the previously mined area; and second, a diversion canal for Bear Valley Creek would be built around the as-yet-unmined ore body on the private land. Enhancement measures would still be funded by BPA while the diversion canal, when built, would be constructed and maintained with Bear Valley Mineral funds. In order to implement the alternative during FY85, Montgomery was charged with producing a Preferred Alternative Report (Part 4, 1984 Annual Report, BPA Project 83-359) for distribution to all interested parties (including the Interagency Task Force) by 21 June 1985. An apparent non-engineering problem within the Preferred Alternative was the suggested mode of obtaining the necessary permits for the entire project. As suggested by the landowner representatives, a single set of permits was to have been requested, however, that approach would have created funding, administration, and actual permit-holder questions. Representatives of the landowners, BPA, Montgomery, and the Shoshone-Bannock Tribes met on 21 June 1985 and worked out a solution to the above questions. Two sets of permits would be applied for: one set by the Shoshone-Bannock Tribes for the enhancement work to begin in 1985 (reaches D and E); and, one set by the landowners for the diversion and drainage channels after mining is approved at some future date. Interagency Task Force members were to meet with the landowners to discuss the Preferred Alternative Report and decide on their endorsement of the 1985 enhancement work on 27 June 1985 (day before the site walkthrough).

Individuals or companies (David Little, MacGregor Land and Cattle Company, and Callender and Beckman) holding grazing permits and running cattle near the project site will be given ample opportunity to examine and comment on the Selected or Preferred Alternative, whichever plan is implemented. Chapter 6 of the Preferred Alternative Report (and a like section in the Selected Alternative Report) dealt with cattle access to the stream and pasture around the site and proposed cattle movement corridors around reaches that will be fenced for a number of years following enhancement. Suggestions by the cattlemen that will improve the overall impact of the project will be incorporated into the enhancement plan.

Given that the implementation of the enhancement portion of the Preferred Alternative will begin in 1985, construction will have to be phased over several years because of BPA funding constraints and overall cost of the project. BPA has tentatively (requires easement and then application for funding by the Tribes) allocated $500K for implementation during FY85. Since cost of the enhancement projects will exceed the FY85 allocation, subsequent requests for annual allocations ($500K) will be made by the Tribes until the project is completed. During FY85, portions of stream reaches D and E (identified by Montgomery as areas with the highest sediementation problems and/or having the highest potential for mass wasting from banks) will be addressed with the allocated funds. In future years, sections that have the largest remaining real or potential sedimentation problems will be addressed first.

A number of technical data and information gaps were also identified by Montgomery in the Feasibility Report. Water quality (in the stream and the dredge ponds), water quantity (annual hydrograph), soil quality, and plant community composition (on disturbed and undisturbed land) were areas that required additional 1984 field work. An early winter postponed the work until 1985. Four field trips for data collection are scheduled in 1985. Planting and monitoring of test plots with different seed mixtures will also be conducted during 1985. During the course of implementation, a "best" mixture will be developed and used during the soil reseeding portions of enhancement measures slated for all stream reaches. New data gathered during the field trips or from the test plots will have a minor affect on enhancement design or project cost but will improve the quality and speed of the enhancement efforts.

Enhancement Evaluation Study

Fish Community Inventory

Chinook salmon were the most abundant species present in Bear Valley Creek during August. and September (Fig. 9). Age 0+ chinook salmon comprised from 25 to 78% of all fish present in August. Densities were higher in strata 5 and 6 (0.31 and 0.23 fish/m^2 pool, respectively) than other strata (0.02 to 0.11/m' pool) (Fig. lOA). Juvenile chinook salmon densities were well below rearing potential (0.3 to 1.7 fish/m') typical of Idaho streams (Sekulich and Bjornn 1977; Bjornn 1978). Total abundance of age 0+ chinook salmon in September was estimated at 18,100 fish (Table 7). Given a spawning potential of 9,375 female chinook salmon (Parkhurst 1950) a fecundity of 4000 eggs per female (mostly 3-ocean fish in Bear Valley Creek), and a conservative egg-to-smolt survival rate of 8% (Bjornn 19781, 3,000,OOO smolts could be produced by Bear Valley Creek annually.

Density of age 0+ chinook salmon decreased significantly in strata 5 and 6 from August to September, the result of pre-smolt out-migration to the Middle Fork of the Salmon River and an unknown mortality rate. Out-migration from upstream strata began the first week of September and continued through the third week of September. Konopacky (1984) observed the same type and timing of migration from Bearskin Creek, a tributary to Elk Creek, in 1979.

Intra- and interspecific competition for food and space is probably minimal for chinook salmon and steelhead trout. Low fish densities and an apparent abundance of suitable habitat (rearing pools) and food producing areas (riffles) preclude adverse competition effects at present. Food quantity is probably not a problem although food quality may be. Most of the riffles in Bear Valley Creek are covered with sand. Invertebrates living in or on the sand would probably be small and not be as potentially important or useful for growth during later stages of a pre-smolt existence in the stream.

Predation of chinook salmon by piscivores is probably low throughout most of Bear Valley Creek, but may have high localized impacts. Highest densities of juvenile chinook salmon and adult brook trout occurred in stratum 5 (Figs. 10A and 13C) which may indicate a predator trap situation exists in the upper reaches of the stream. Although their densities are low (Figs. 12B and 11D) and both species are endemic to Bear Valley Creek, bull and cutthroat trout may act as predators on chinook salmon and steelhead trout fry. Brook trout were introduced to the stream and were not recognized as being present in the stream by some past Idaho Department of Fish and Game internal publications. Intra- and interspecific competition for food and space is probably minimal for chinook salmon and steelhead trout. Low fish densities and an apparent abundance of suitable habitat and food preclude adverse competition effects at present.

Habitat Inventory

Flow during September (lowest recorded) ranged from 13.2 m^3/second in stratum 1 to 0.2 m^3/second in stratum 6 (Fig. 3A). Flow did not limit chinook salmon passage or survival in Bear Valley Creek during August and September. No chinook salmon were observed above where Bear Valley Creek forks in the headwaters stratum, approximately 0.6 km above the mine stratum. Absence of chinook salmon above the fork is probably a result of nonuse by adults for spawning and a general downstream dispersion of fry from redds. Bovee (1978) reported adult spring chinook salmon preferred deeper water, larger substrate, and higher velocity water for spawning than exists above the headwater fork in Bear Valley Creek.

Water temperature in Bear Valley Creek ranged from 0 to 19C during August and September (Table 6). Temperature extremes probably occurred for only short periods of time during a diel cycle and did not appear to limit growth or survival of age 0+ chinook salmon. Preferred range of water temperature for juvenile chinook salmon is 7 to 15 C, with an upper lethal temperature of 25C (Reiser and Bjornn 1979). U.S. Forest Service personnel (Internal report) found temperatures in Bear Valley Creek ranged from 0 to 13C above the mine and from 5 to 20C below the mine during the same periods of time (June through September) in 1972 and 1973. Forest Service personnel suggested that the mine caused the increase in water temperatures which, subsequently, affected chinook salmon growth and survival even though their downstream data was collected 31 km below the mine and below the confluence with Elk Creek. Our data, collected just above and below the mine, showed very little temperature difference and did not support a like conclusion, however, 1984 was a high water year and temperature effects may have been buffered by the thermal capacity of the higher flows.

The amount of riffle and pool area in Bear Valley Creek is not a major limitation to the present level of chinook salmon numbers. Parkhurst (1950) found Bear Valley Creek contained pre-mining potential spawning areas for 9,375 salmon. Approximately 60 female fish have spawned in Bear Valley Creek each year during recent years (Fig. 2). Thus, although the stream is heavily impacted and the potential spawning area far exceeds the amount currently available, spawning areas are still underutilized, at present, because of low escapement.

Sedimentation may limit chinook salmon production in Bear Valley Creek. Sedimentation of riffles is high (30 to 50% of riffle substrates were <8 mm in diameter) in Bear Valley Creek below the mine (strata 4 and 5) and below the confluence with Elk Creek which, historically, were the primary (95%) spawning areas for chinook salmon (Figs. 6 and 7). Bjornn et al. (1977) found riffles with fines (<6.4 mm diameter particles) exceeding 20% usually had adverse effects on spawning success. Lower sediment in other strata probably resulted from higher gradient and a longer distance from sediment sources. Central sections (strata 2,3,4 and 5) of Bear Valley Creek have low capacities for natural rejuvenation as a result of low gradient (< 0.3%) and the accumulation of sediment (fines) over time. Spring flows (< 17 m /second; Brian Liming, personal communication) lose potential flushing energies as the broad, low-lying valleys are flooded. Higher proportions, although small numbers

(< 10), of spawners are utilizing gravels above and in the mined section in recent years than in earlier count-years (Internal data, Idaho Department of Fish and Game). Less sedimentation of riffles has occurred in these upstream sections of Bear Valley Creek because of high gradient and downcutting which leaves behind larger particles from the mining overburden and flushes the fines donwnstream. Reasons for the higher proportion of upriver spawning may include: inadequate spawning gravels downstream and a search upstream by adult salmon for suitable gravels; and/or, higher pre-emergent survival rates in upstream than downstream riffles and, thus, a disporportionate number of fish return to that portion of the stream to spawn.

Fine sand has partially filled in most rearing pools in Bear Valley Creek (Fig. SD) which results in loss of depth and, subsequently, rearing space and cover. The highest percent of pool substrates comprised of sand occurs below the mine and below the confluence with Elk Creek. These areas also have the lowest gradient (0.1%) in Bear Valley Creek and, thus, act as sediment traps. At present, sedimentation of pools does not constitute a major limitation to juvenile chinook salmon rearing because fry numbers are low. With a projected increase in run size, rearing area may limit juvenile production unless sediments are flushed from pools naturally (spring flows) or mechanically (Mih 1979).

Riparian cover constitutes the majority of existing cover for chinook salmon in most of Bear Valley Creek. Riparian cover is poor in the mined stratum as a result of unvegetated and unstable banks (Fig. 8). Riparian cover is also poor in sections of meadow strata because of sloughing undercut banks and a predominance of depositional sand bars.

Enhancement Benefits

Habitat enhancement in the mined area will reduce sediment recruitment from the mine. Although reductions via enhancement may approach 900 m^3/year during normal years, the reduction of potential sediment recruitment may greatly exceed this amount during a year with a 50- or 100-year event. Uncommon hydological events would provide a high potential for sidecutting the unconsolidated overburden in the mine (Part 2, 1984 Annual Report, BPA Project 83-359).

Enhancement in the mine will not reduce sediment recruitment into Bear Valley Creek from other point and non-point sources. Other sources (natural and unnatural), exterior to the mine, contribute substantial amounts of sediment to Bear Valley Creek (Internal report, Boise National Forest). Enhancement in the mine will not substantially reduce sediment already in the stream. As recruitment of sediment is reduced and stopped from the mine, stream waters will be able to transport more downstream sediments. However, as a result of low gradient and coarse nature of the fines, yearly reductions in streambed sediment will be relatively small when compared to the work capacity of spring flows in higher gradient streams. After or during the enhancement of the mined area, another project should assess the feasibility of accelerating removal of sediment from the stream on Forest Service land.

Habitat enhancement in the mined area will improve rearing and adult resting cover in the mined area through stabilization and revegetation of stream banks. Downstream riparian cover will be indirectly improved over time as the extent of unstable sand bars are reduced. Instream cover (depth) will also be enhanced as sediments are flushed from pools.

Sensitivity of Evaluation Study

A high degree of precision associated with each variable estimate is necessary to evaluate the responses of habitat and fish populations to an enhancement project. Without high precision, a biologically significant response may not be statistically discernable. Data collected from 49 sites in Bear Valley Creek and used to estimate age 0+ chinook salmon numbers produced a 23% error of estimation around the total estimate (Table 7). Thus, age 0+ chinook salmon numbers must change approximately 463, with the same precision in some future year and the estimate weighted for a change in redd numbers, to attribute that reponse to enhancement. To associate responses to enhancement within strata (n=7), fish numbers will have to change from 14 to 138% depending on the stratum (Table 7). Thus, the intensity of our sampling design resulted in only minimal sensitivity to future changes in fish numbers.

Accurate yearly redd counts constitute an important variable extraneous to our sampling design. Partial redd counts (trend areas) have been used as an index of relative seeding rates in Idaho streams (Intrnal report, Idaho Fish and Game Department). To attribute a change in fish numbers to the enhancement effort (treatment), the proportion of this response resulting from a changing seeding rate must first be blocked out. A large percentage (38%) of chinook salmon fry were found upstream of where redds counts have been traditionally made in Bear Valley Creek (Fig. 17). In future years, redd counts will be made in these upstream reaches to help provide more accurate seeding estimates.

Additional Enhancement Alternatives

Sediment recruitment into Bear Valley Creek comes from a number of point and non-point sources other than the mined area. These sources include: livestock (trampling of stream banks, denuding of riparian cover and compaction of meadow soils) barren upland slopes, natural stream cutting, logging, and unstable tributary drainages. Sediment recruitment from these other sources must be addressed before an optimal amount of habitat will be realized in Bear Valley Creek. Documentation and prioritization of sediment sources extraneus to the mine have been initiated (BPA Contract No.

84-24) in cooperation with the Forest Service and Bonneville Power Administration pursuant to this objective. Other enhancement alternatives include the construction of spawning channels and/or low-cost rearing ponds to enhance pre- and post-emergent survival. Survival of juvenile chinook salmon and steelhead trout could also be enhanced by the reduction or elimination of introduced predators (i.e., brook trout).

Cost-benefits of Enhancement Project

Spending the projected $3 million ($2.5+ million for implementation and $400+K for pre-enhancement tasks, evaluation, administration) on the Bear Valley Creek enhancement project is justified by the number and value of spring chinook salmon and steelhead trout that will be produced by the stream over the expected life (50 year minimum) of the treatment. Parkhurst (1950) estimated a maximum of 9,375 female salmon could spawn in Bear Valley Creek before mining occurred. Idaho Department of Fish and Game (Internal report) observed a maximum of 1085 redds in a trend area (middle 32 km of the 54.5 km stream) in 1956. Steelhead trout use of Bear Valley Creek has been verified (Thurow 1985) although no quantified data exists, thus, our cost-benefit rationale utilizes only potential spring chinook salmon returns. Assuming that passage and downriver harvest problems are alleviated and the enhancement project will increase usable spawning areas lOOO%, an additional 8,437 spawners (10 times the present potential) could return in a given year as a result of the enhancement project. From these females, an estimated 33.7 million embryos (4,000~ eggs per female with optimum fertilization) could be deposited in stream gravels. Assuming a 10% embryo-to-smolt survival, 3.4 million smolts would be produced each year. Given that the effects of the project would be felt for 50 years, the cost per returning adult would be $7.11, and the cost per smotl produced would be $0.71. Again, these estimates would be conservative from the standpoints that survival estimates are based on: recent data which reflect poor passage, effects of the project could be felt for more than 50 years, and no benefits from an expected increase in steelhead spawning and rearing survival were included. Partially offsetting cost per fish would be anticipated expenditures on habitat below the mine on Forest Service land (BPA Project 84-24). Although not appreciated in the immediate drainage, increased harvest of Bear Valley Ceek fish would take place in the main stem Columbia, Snake, and Salmon rivers, and in the ocean by a number of user-groups.

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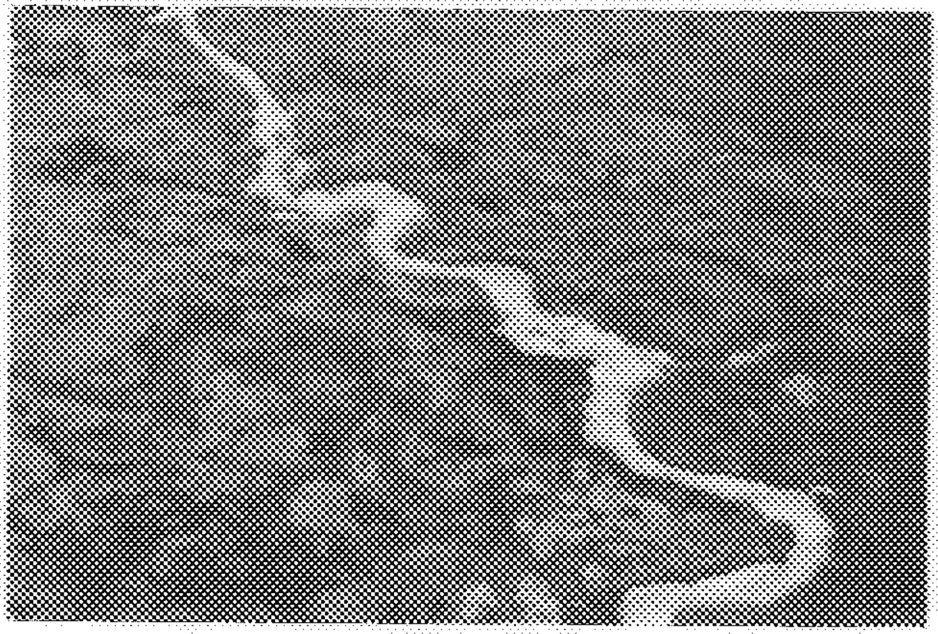
APPENDIX



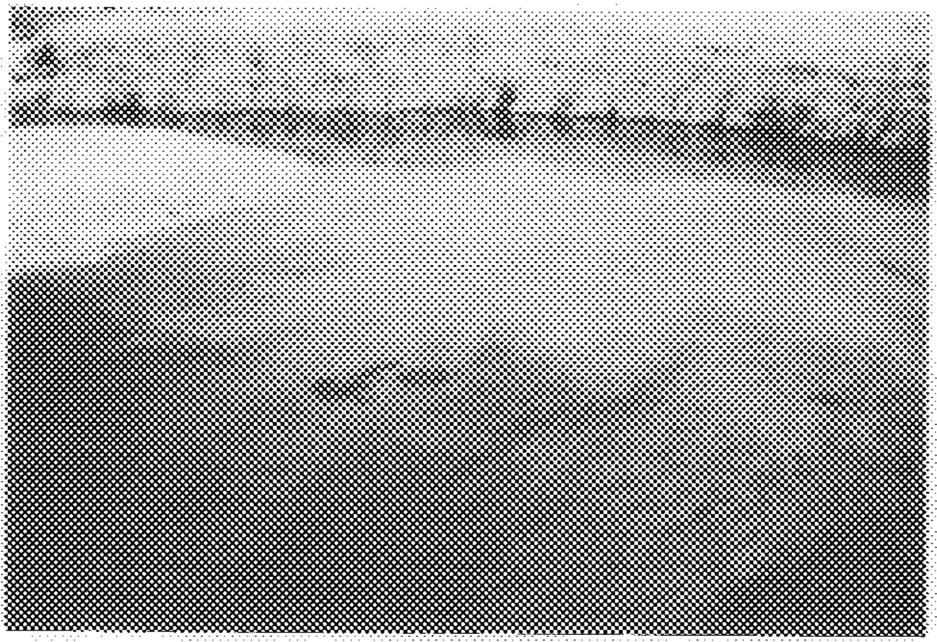
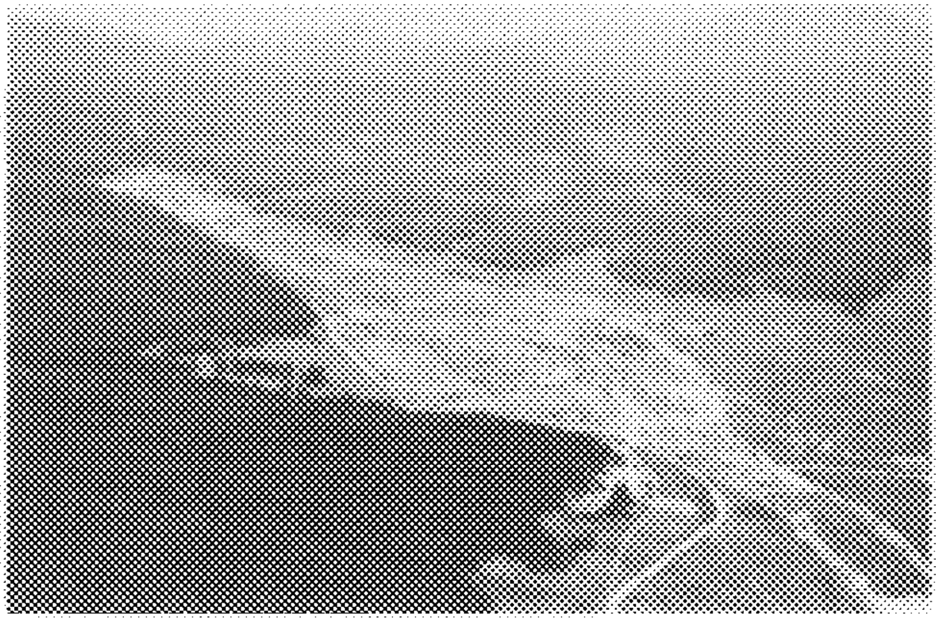


Figure 1. Typical reaches on patented land which have not been mined (stratum 5), Bear Valley Creek, Idaho, 1984.



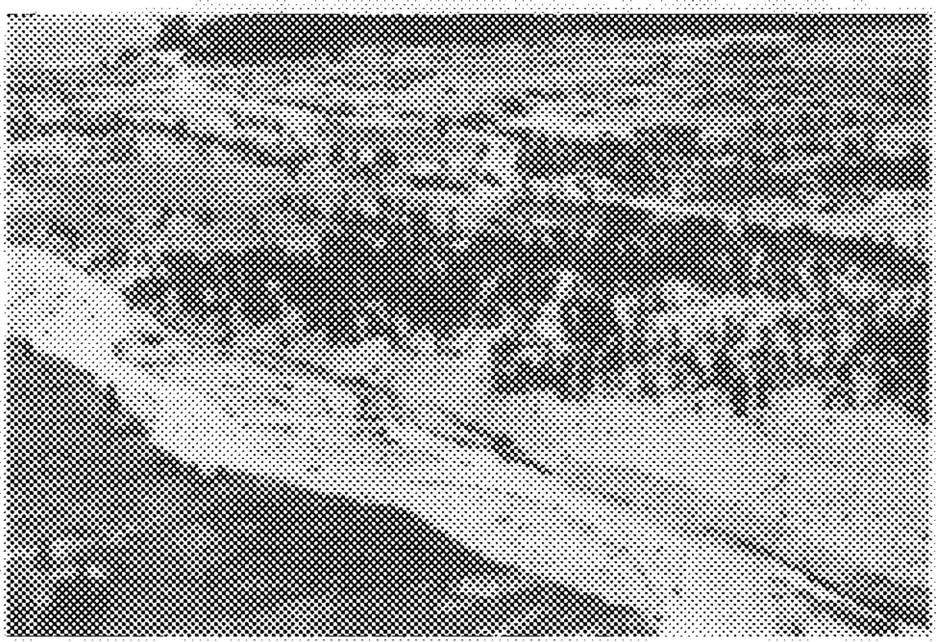


Figure 2. Typical reaches on patented land which have been mined (stratum 6), Bear Valley Creek, Idaho, 1984.

SUBPROJECT II

Middle Fork/Upper Salmon River:

Planning and Coordination

ACTIVITIES

Dr. Richard C. Konopacky, Project Leader (BPA Project No. 83-359) and a representative of the Shoshone-Bannock Indian Tribes, consulted with personnel from Bonneville Power Administration (BPA), Idaho Department of Fish and Game, land management agencies, and private land owners on aquatic habitat enhancement projects (ongoing and proposed) on the Salmon River and the Middle Fork of the Salmon River above their confluence. The Fort Bridger Treaty of 1868 entitles tribal members to fish in those drainages mentioned above and was used as the criteria for Tribal involvement in project coordination efforts and the cooperative management of anadromous fish resources within Treaty areas.

The Project Leader (PL) reviewed proposals submitted to BPA by private consultants for a habitat enhancement project (mining impacts) on Panther Creek (BPA Project No. 84-29) on 1 August in Portland. BPA awarded the Bechtal Group, Inc. of San Francisco the project contract. The PL met with technical personnel of other interested agencies and discussed the project work plan of Bechtal on 13 November 1984.

The PL reviewed proposals submitted to BPA for a habitat enhancement project (irrigation impacts) on the Lemhi River (BPA Project No. 84-28) on 21-22 August in Boise. BPA awarded Ott Water Engineers of Bellvue, Washington the projectcontract. Ott's project *work* plan was discussed by the PL and other interested agency personnel during a followup meeting on 13 November in Boise.

The PL reviewed the project work plan for a habitat evaluation project (sponsored by the U.S. Forest Service-Region 3) on the Upper Salmon River, Middle Fork of the Salmon River, and tributaries of both streams (BPA Project No. 84-24) on 14 November in Boise. Methodologies in' the work statement were again discussed at 28 November and 11 December meetings *in* Boise. Further meetings were considered necessary before a request-for-proposals was to be issued by the Boise National Forest.

The PL met with Idaho Department of Fish and Game personnel to discuss the prioritization, chronological order, and funding basis of ongoing and/or future habitat enhancement projects within the Tribal fishing areas as addressed by the Fort Bridger Treaty of 1868. After a general agreement on rankings of the projects, both parties *also* agreed that *all state* projects, including those sponsored by the Shoshone-Bannocks and Idaho Department of Fish and Game, should be reviewed and endorsed or deferred by a yet-to-be-organized group of technical personnel which would represent all interested Tribes and agencies in the state of Idaho.

The PL or another representative of the Shoshone-Bannock Tribes attended a series of meetings dealing with the Passage and Habitat Improvement Work Plan for 1985 (Section 704) in Portland (17 October and 12 December) and Spokane (14

November). At the 12 December meeting, agency and Tribal representatives concluded that a means of evaluating the effects of habitat improvement projects was necessary for justification and mitigation purposes. The PL was asked to participate on a subcommittee (9 members) of the group that was charged with the development of an evaluation methodology that would measure the effects of a habitat enhancement project on the habitat and fish population of a proect stream and would have a basin-wide application.

SUBPROJECT III

Yankee Fork of the Salmon River:
Inventory and Problem Identification

ABSTRACT

Extensive dredge mining has disrupted much of the aquatic habitat in the Yankee Fork of the Salmon River drainage. Aquatic habitat and fish communities were inventoried in the Yankee Fork of the Salmon River, the West Fork of the Yankee Fork of the Salmon River, and Jordan Creek (the latter two streams are tributries to the Yankee Fork) for use as pre-treatment data to evaluate anticipated habitat enhancement. Physical and biological variables were measured (one time) in four sites within each of four strata along the length of the Yankee Fork (27 km) and four sites within one stratum in each of the West Fork of the Yankee Fork (13 km) and Jordan Creek (10 km). Fish data were collected via snorkel-observations, electrofishing, and seining. Minimum and maximum water temperatures ranged from 0 to 2C and 9 to 14C, respectively, during September. Riffle and pool areas, flow, stream width, and pool depth were largest in downstream strata of mainstem Yankee Fork and lowest in Jordan Creek. Gradient was highest (2.6%) in Jordan Creek and lowest (0.7%) in the dredge-mined strata. Highest frequency (8%) of fine (< 8 mm diameter) sediments occurred in upper Yankee Fork and did not differ significantly ($P>0.05$) with the lowest frequency (2%) which occurred in the West Fork. In decreasing order of abundance, salmonid species in the Yankee Fork drainage included: steelhead/rainbow trout (Salmo gairdneri), chinook salmon (Oncorhvnchus tshawvtscha), mountain whitefish (Prosopium williamsoni), cutthroat trout (S. clarki), and bull trout (Salvelinus confluentus). Shorthead sculpin (Cottus confusus) were present in all strata but we did not estimate abundance. Estimated abundance of age 0+ chinook salmon was 12,847 fish in August: density was highest (0.16 fish/m^2 pool) in the West Fork and lowest (0.0006 fish/m^2 pool) in the lower stratum in Yankee Fork that had been mined. Length, weight, and condition of age 0+ chinook salmon (ranges: 74 to 90 mm, 3.8 to 7.8 g, 0.94 to 1.05, respectively) were higher in upstream than downstream strata. Age 0+ steelhead/rainbow trout densities ranged from 0.02 fish/m^2 pool in the lower mined stratum to 0.10 fish/m2 pool in upper Yankee Fork. Densities of age 0+ and adult mountain whitefish ranged from 0 to 0.005 and 0 to 0.02 fish/m^2 pool, respectively. Density of adult cutthroat trout (range: 0 to 0.02 fish/m^2 pool) was highest in Jordan Creek, whereas density of age 1+ and older bull trout (range: 0 to 0.002 fish/m^2 pool) was highest in the West Fork. Salmonid habitat and passage problem areas were identified and prioritized for remediaton throughout the entire Yankee Fork system. Major sedimentation problem types, in descending order of potential sediment input, include: dredge tailings, sloughing stream banks, open slopes, roading adjacent to the stream, and washouts. Passage problems included low flows and log jams.

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INTRODUCTION

The Yankee Fork of the Salmon River, a major tributary of the mainstem Salmon River, is a spawning and rearing stream for anadromous salmonids. Past redd counts (Internal data, Idaho Department of Fish and Game) indicate the Yankee Fork *was* an important spawning stream for wild *spring* chinook salmon (Oncorhynchus tshawvtscha) in the Salmon River drainacre. Redd counts are depressed to less than 50 redds per year during the 1980's from approximately 400 redds per year during the 1960's through early 1970's (Internal data, Idaho Department of Fish and Game). No hatchery supplementation of these salmon stocks have occurred to date. Although no redd count data exists, wild steelhead trout (Salmo gairdneri) also utilize the Yankee Fork for spawning and rearing. Steelhead have been supplemented by hatchery outplanting during recent years.

The Yankee Fork of the Salmon River system has a long history of adverse land use practices which have contributed to the decline of anadromous fish runs. Dredge-mining for gold *since* the late 1800's has severely altered stream conditions for several miles in lower Yankee Fork and lower Jordan Creek. Extensive unconsolidated and unvegetated dredge tailings have increased sedimentation of spawning riffles and rearing pools and reduced riparian cover.

The Yankee Fork system is an important (and treaty guaranteed) anadromous fishing area for members of the Shoshone-Bannock Tribes. As a conservation measure, the Tribes have voluntarily chosen not to exercise this treaty right since 1978. Through BPA funding and in anticipation of potential habitat enhancements, the Tribes conducted fish and habitat inventories during 1984. These inventories included identification and prioritization of problems affecting fish and their habitats throughout the system.

Objectives of this study *were: 1)* to *inventory* fish populations and their habitats in the Yankee Fork system; and 2) to identify on-site problems affecting fish populations and their habitats, and prioritize the problems for remediation.

STUDY AREA

The Yankee Fork of the Salmon River, located in Custer County, Idaho, is a major tributary of the upper Salmon River (Fig. 1 and Table 1). The West Fork of the Yankee Fork of the Salmon River is the largest tributary to Yankee Fork. Other notable tributaries to the Yankee Fork include Jordan, Lightning and Eightmile creeks. The Yankee Fork of the Salmon River is a low to medium gradient system which flows through narrow canyons, moderately wide valleys of lodgepole pine forests, and wide meadowed valleys. Most of the system is roaded and lies in an area of the Challis Volcanics characterized by highly erosive sandy and clay-loam soils. Adjacent lands are owned predominately by the U.S.Forest Service (Challis National Forest) and mining permittees.

The inventory and problem identification studies addressed 49.3 km of the Yankee Fork system which extended from the mouth to the confluence with Eightmile Creek; the West Fork Yankee Fork up to the confluence with Cabin Creek: and, Jordan Creek up to the Loon Creek Summit road.

Substantial sections of the mainstem Yankee Fork (9.7 km) and lower Jordan Creek (2.4 km) have been dredge-mined for gold which resulted in extensive barren dredge tailings adjacent to the stream. Smaller dredge, placer, deep rock, and open pit mines continue to operate in upper Yankee Fork and Jordan Creek. Permits are for both commercial and recreational operations. Roads parallel the entire system except the West Fork of the Yankee Fork. Livestock grazing is limited to the upper mainstem Yankee Fork.

The Yankee Fork system is an important spawning and rearing stream for chinook salmon and steelhead/rainbow trout. Utilization by chinook salmon has declined since the mid-1960's (Fig. 2). Other fish species present in the Yankee Fork system include bull trout (<u>Salvelinus confluentus</u>), cutthroat trout (Salmo <u>clarki</u>), mountain whitefish (<u>Prosopium Williamsoni</u>), and short head sculpin (<u>Cottus confusus</u>).

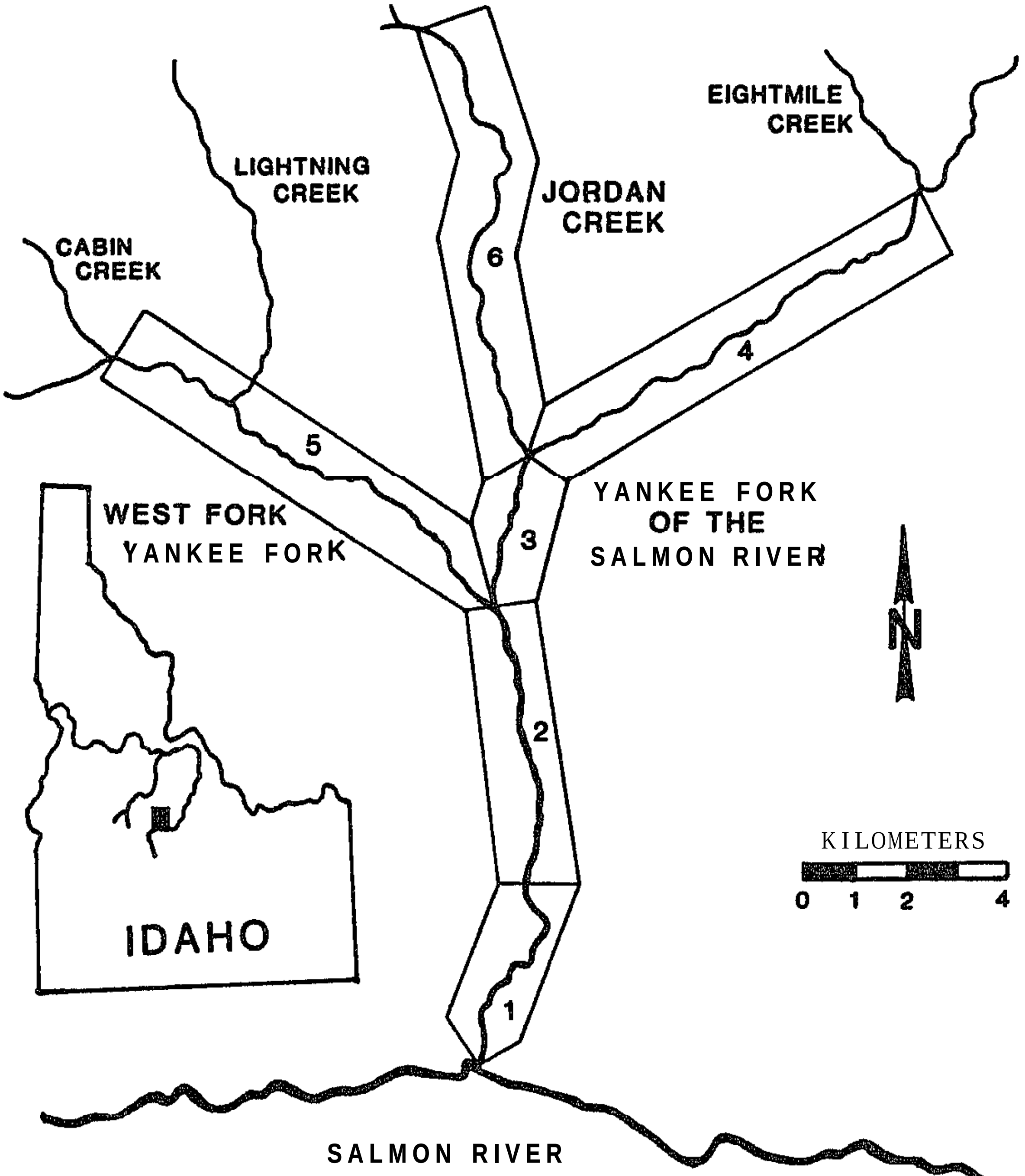


Figure 1. Yankee Fork of the Salmon River, Idaho, study area and strata location.

Table 1. Strata characteristics, Yankee Fork of the Salmon River, Idaho.

Stratum	Length	Gradient	Land type	Land ownership	Land use
1[a]	5.5[b]	Medium-high	Narrow forested valley	USFS[c]	Non-consumptive
2	6.0	Medium	Wide valley, sparse forest	USFS,JRS[d], private	Mining
3	3.8	Medium	Wide valley, Sparse forest	USFS,JRS, private	Mining
4[e]	11.8	Medium	Moderately wide valley, forest	USFS, private	Mining, grazing
5[f]	12.7	Medium	Moderately wide valley, forest/meadow	USFS	Non-consumptive
6[g]	9.6	High	Narrow forested valley	USFS,JRS, private	Mining

[a] stream mouth.
[b] kilometers.
[c] U.S. Forest Service, Challis National Forest.
[d] J.R. Simplot, Boise, Idaho.
[e] stream headwaters.
[f] West Fork of the Yankee Fork of the Salmon River.
[g] Jordan Creek, tributary to the Yankee Fork of the Salmon River.

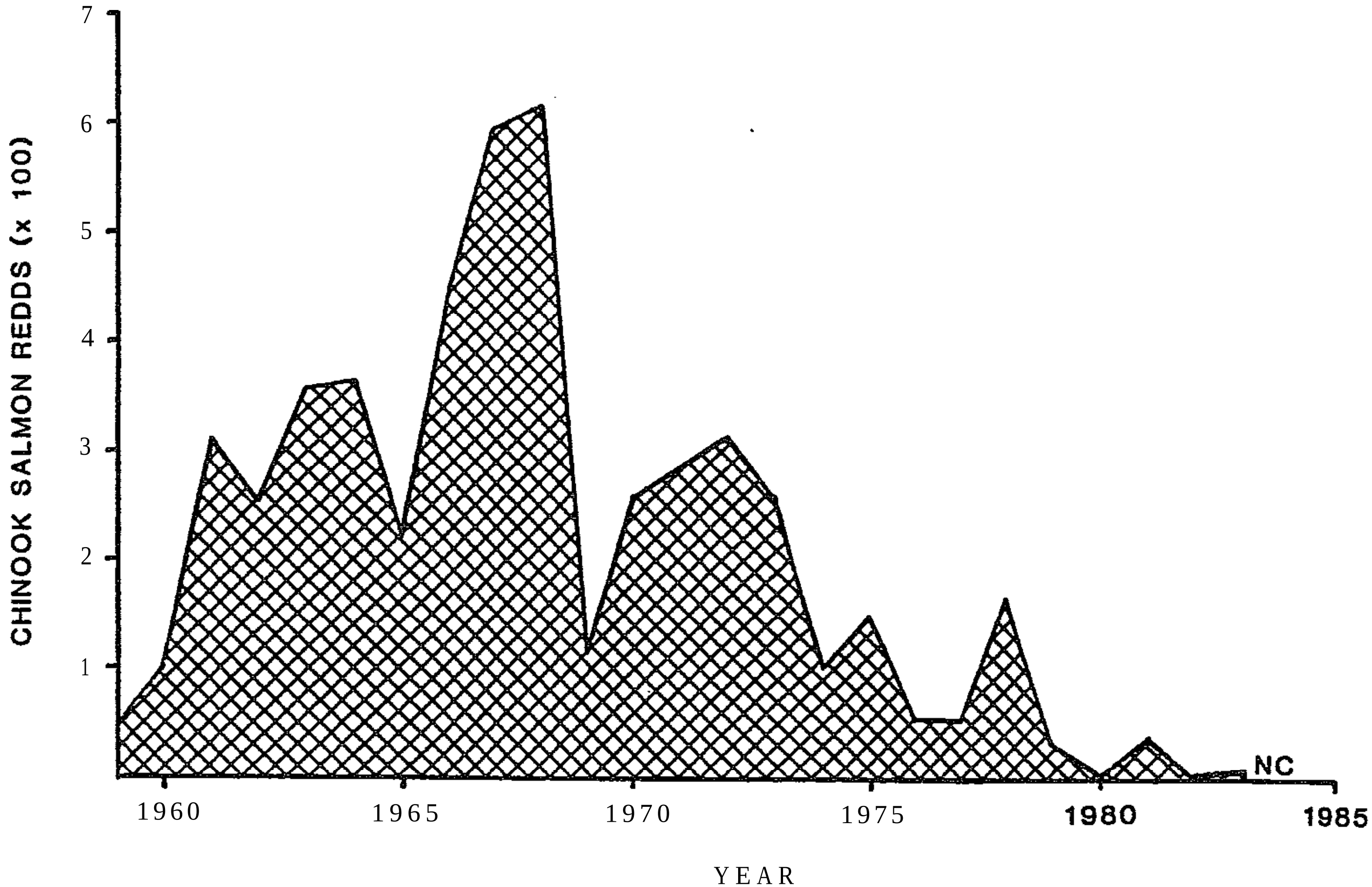


Figure 2. Counts of spring chinook salmon redds in Yankee Fork of the Salmon River, Idaho, 1959-1984. Pre-1960 counts were made by walking the stream while counts in later years were made from the air.

METHODS

Habitat and Fish Community Inventories

Variables

Habitat and biological variables measured in Yankee Fork (Table 2) were similar to variables measured in Bear Valley Creek during 1984 (Methods, Sub-project 1, Enhancement Evaluation Study). An additional variable measured in the Yankee Fork was percent of riffle substrates coated with superfines and algae.

Variable Measurement

Measurement of variables in Yankee Fork followed methodologies used in Bear Valley Creek during 1984 (Methods, Sub-project 1). In addition, frequencies of riffle substrates coated with superfines and algae were determined by noting "coated" or "uncoated" for each riffle substrate measured (while determining riffle substrate size distributions).

Experimental Design

A similar sampling scheme (split plot in time or repeated measure) was used in Yankee Fork as in Bear Valley Creek during 1984 (Methods, Subproject 1) (Tables 3 and 4) with two exceptions: measurements were at four sites within each of six strata (seven and seven in Bear Valley Creek) (Fig. 1); and, measurement of biological variables occurred once in September (August and September in Bear Valley Creek). During 1985 and later years and following enhancement, all variables will be measured at 6 sites within each of five strata and biological variables will be measured twice (July and August) per year.

Problem Identification

The Yankee Fork drainage was separated into 5 reaches on the basis of mining activities (past or present), stream size, valley width, and location in the drainage. The entire length of each reach was walked and reach characteristics and problem areas described. Reach characteristics included: stream, size and gradient: riffle-pool type: extent and quality of spawning and rearing habitat; stream bank type, stability and riparian cover; valley width; and, upland slope cover. Problem areas were identified in relation to sediment sources, habitat degradation, and passage barriers. The type, extent and relative severity of each problem was estimated during the walk through and recorded. Air photos were taken at low levels along each reach. Problem sites were marked on acetate overlays to help measure their frequency and extent within each reach. Length of similar problem types were summed from each reach and the percent of the total reach each problem type comprised was calculated.

Table 2. Habitat and biological variables monitored in Yankee Fork of the Salmon River, Idaho, 1984.

Habitat	Biological (Fish)
Temperature	Species composition
Flow (discharge)	Relative abundance
Surface area	Density
Stream width	Population number
Stream depth	Length
Stream gradient	Weight
Riparian cover	Condition
Stream substrate	

Table 3. Experimental designs, used in 1984 and proposed for 1985, for sampling habitat variables on the Yankee Fork of the Salmon River, Idaho.

Source	Degrees of freedom
1984	
6 Strata	5
4 Replicates (Stratum), Error A	18
TOTAL	23
1985	
6 Strata	5
6 Replicates (Stratum), Error A	30
2 Years	1
Years x Strata	5
Error B	30
TOTAL	77

Table 4. Experimental designs, used in 1984 and proposed for 1985, for sampling biological variables on the Yankee Fork of the Salmon River, Idaho.

Source	Degrees of freedom
1984	
6 Strata	5
4 Replicates (Stratum), Error A	18
TOTAL	23
1985	
6 Strata	5
6 Replicates (Stratum), Error A	30
2 Times per year	1
Times x strata	5
Error B	30
2 Years	1
Years x strata	5
Error C	66
TOTAL	143

Problem types for each reach were ranked according to their estimated contribution of sediment into the reach. This ranking was based on the extent, instability, proximity, and type of erosive material for each problem type. Problem areas for each reach were also ranked according to their estimated priority for correction. Priority was based on sediment contribution, size, ease and feasibility of correction, and cause (natural or unnatural) for each problem type.

RESULTS

Habitat Inventory

Water temperature ranged from 0 to 14 C during September (Table 5). Minimum temperatures ranged from 0 to 2 C among strata. Maximum temperatures ranged from 9 to 14 C among strata.

September flows in main stem Yankee Fork ranged from 3 m^3/second in stratum 2 to 1 m^3/second in stratum 4 (fig. 3A). Flows in the West Fork of Yankee Fork (stratum 5) and Jordan Creek (stratum 6) were 0.8 and 0.3 m^3/second, respectively.

Riffle and pool areas differed (F=14.6, P=O.OOOl) among strata (Fig. 3B) and ranged from 2471 m^2 in stratum 2 to 100 m^2 in stratum 6. Site (riffle plus pool) areas did not differ significantly (P>O.OS) among: strata 1,2 and 3: strata 1,3 and 4; or, strata 4 and 5. Site area was significantly larger in strata 2 than in strata 4,5 or 6. Stratum 6 had a significantly (P 5 0.05) smaller site area than other strata.

Pool widths differed (F=9.9, P=O.OOOl) among strata and ranged from 15 m in stratum 2 to 5 m in stratum 6 (Fig. 4A). Widths did not differ significantly among: strata 1,2 and 3; strata 1,3 and 4; or strata 3,4 and 5. Pool width was significantly smaller in stratum 6 than in other strata.

Maximum pool depth differed (F=8.0, P=O.0004) among strata and ranged from 0.5 m in stratum 6 to 1.2 m in stratum 1 (Fig. 4B). Pool depth did not differ significantly between strata 1 and 2 or among strata 2,3,4 and 5. Depth was significantly higher in stratum 1 than in strata 3,4,5 and 6. Depth was significant lower in stratum 6 than other strata.

Gradient differed (F=8.9, ~=0.0003) among strata and ranged from 0.7% in stratum 2 to 2.6% in stratum 6 (Fig. 4C). Gradients did not differ significantly among strata 1,2,3,4 and 5, all of which had significantly lower gradients than stratum 6.

The percent of pool bottom covered with fines (embeddedness) differed (F=4.0 P= 0.01) among strata (Fig. 4D) and varied from 11% in stratum 3 to 56% in stratum 2. Embeddedness did not differ significantly among strata 1,3,4,5 and 6, all of which were significantly lower than stratum 2.

Size frequency (%) distribution of riffle substrate particles differed (Q=48.5, P=O.OOOl) among strata (Fig. 5). Distribution for stratum 2 did not differ significantly from strata 3 and 5. Distributions varied significantly among other strata-pair combinations. The frequency (%) of fine (less than 4 or 8mm diameter) riffle substrate did not differ (F= 1.9, P=O.15) among strata and ranged from 2% in stratum 5 to 8% in stratum 4 (Fig. 6A). The percent of riffle substrates covered with superfines ranged from 36% in stratum 3 to 11% in stratum 5, but did not differ significantly (F=1.3; P=O.31) among strata (Fig. 6B).

Table 5. Water temperature (C) extremes by stratum in the Yankee Fork of the Salmon River, Idaho from 7 September to 28 September, 1985.

Stratum	Temperature (C)	
	Minimum	Maximum
1	2	14
2	0	14
3	0	NA
4	1	9
5	NA	NA
6	2	12

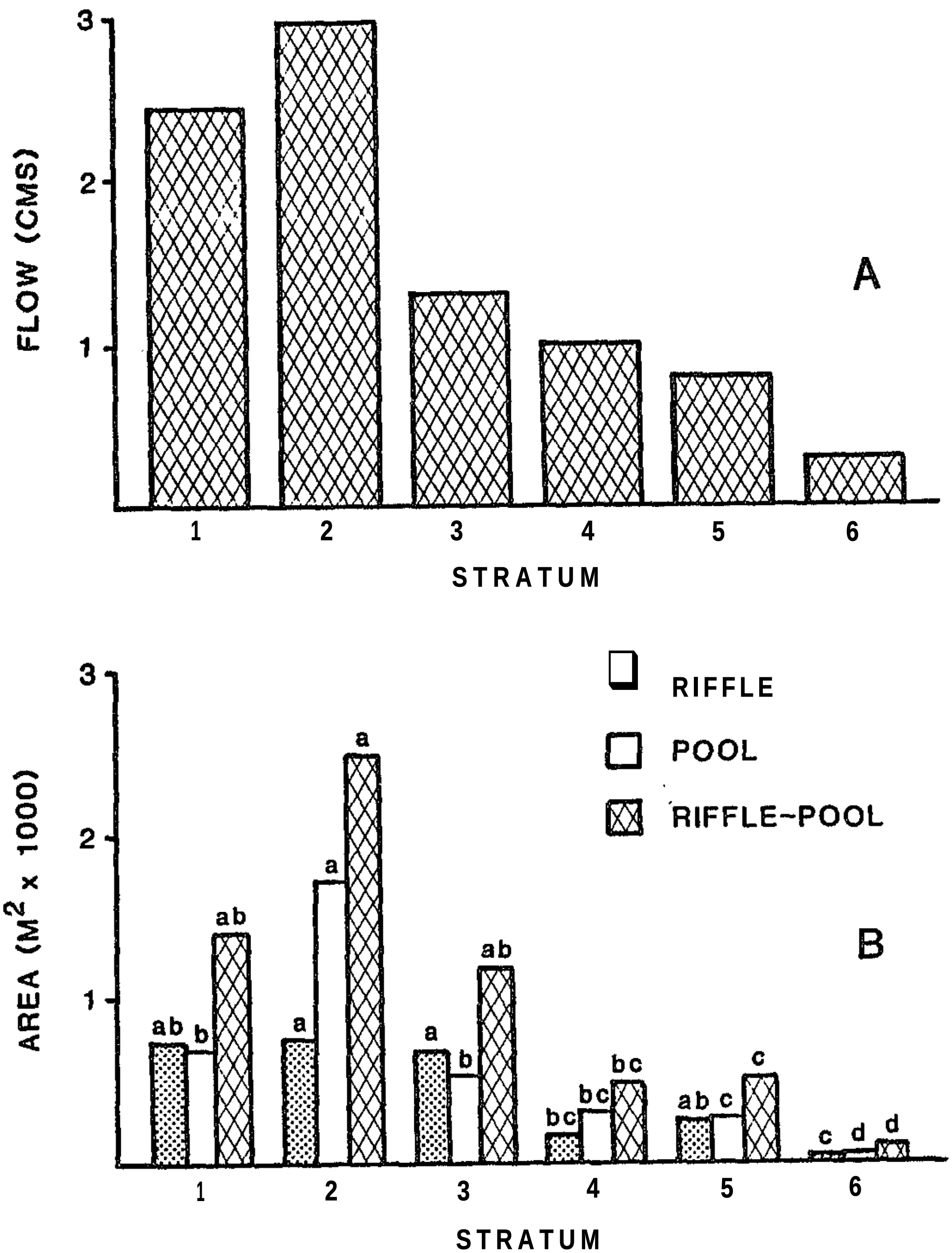


Figure 3. Flow (A) and mean (n=4 per stratum) riffle, pool, and combined riffle-pool areas (B) by stratum, Yankee Fork of the Salmon River, Idaho, 1984. A common letter above means indicate a non-significant (P>0.05) difference among strata means.

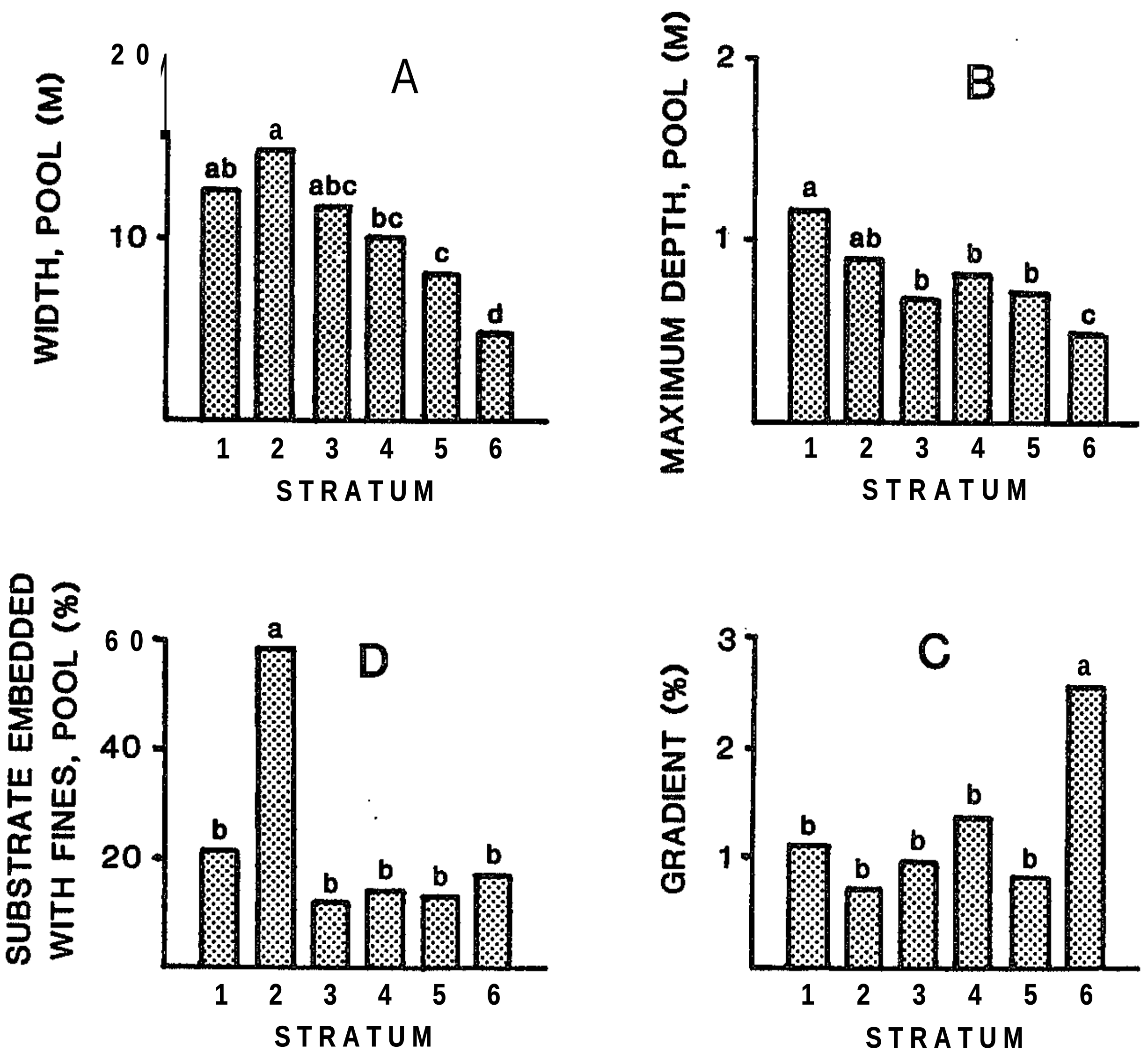


Figure 4. Mean (n=4 per stratum) pool width (A), maximum pool depth (B), gradient (C), and percent of pool substrate embedded with fines (D) by stratum, Yankee Fork of the Salmon River, Idaho, 1984. A common letter above means indicate a non-significant (P>0.05) difference among strata means.

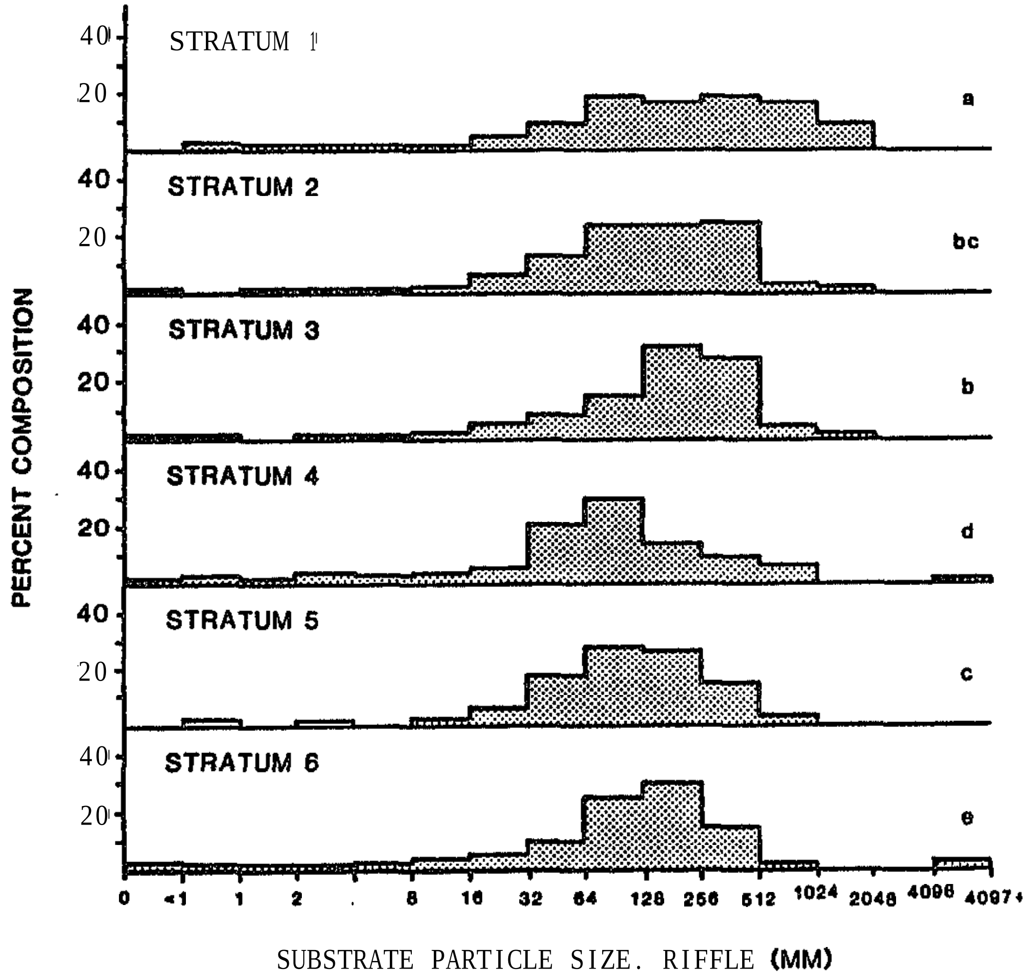


Figure 5. Mean (n=4 per stratum) distributions of substrate particle sizes in riffles by stratum, Yankee Fork of the Salmon River, Idaho, 1984. A common letter next to distributions indicate a non-significant (P>0.05) difference between distributions.

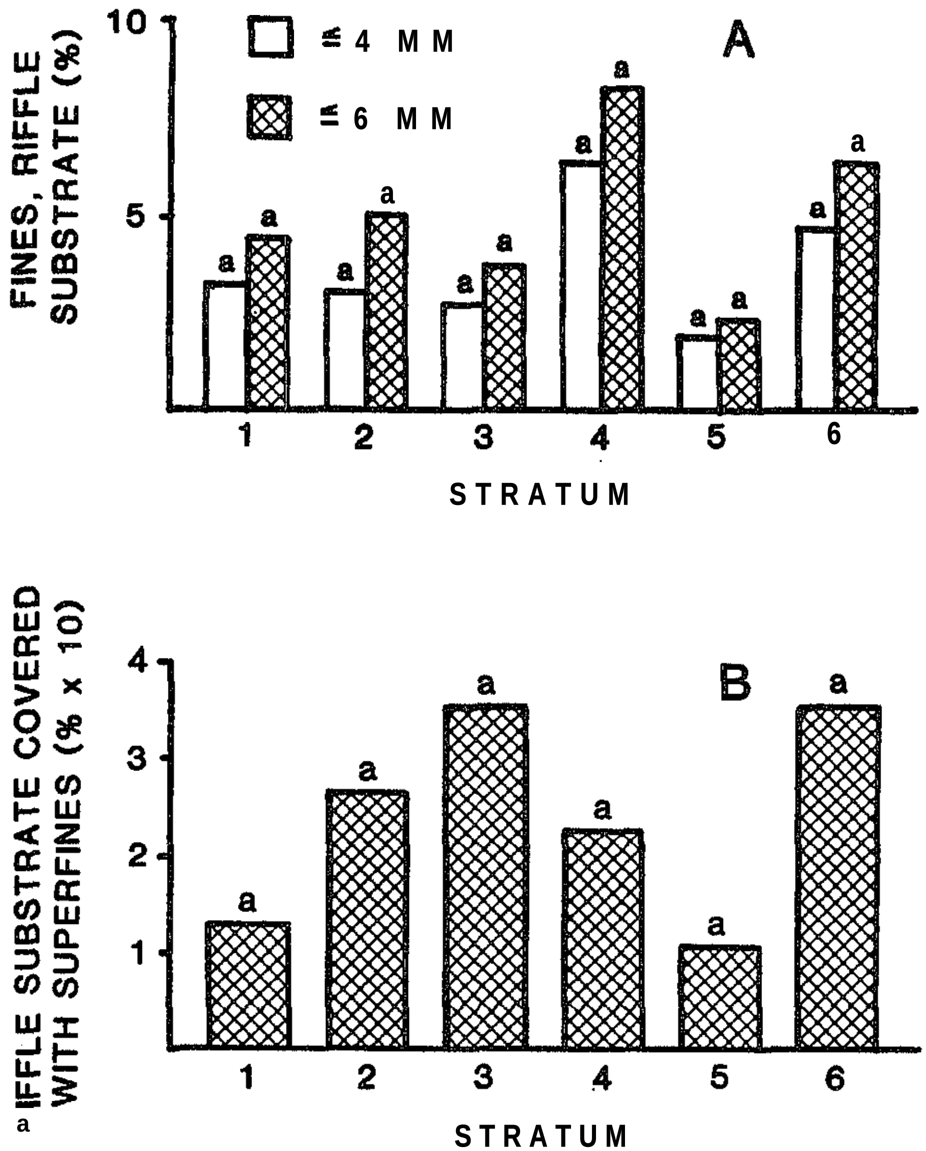


Figure 6. Mean (n=4 per stratum) percent of riffle substrate particles less than or equal to 4 and 8 mm diameter (A) and percent of riffle substrate particles coated with superfines (B), by stratum, Yankee Fork of the Salmon River, Idaho, 1984. A common letter above means indicate a non-significant (P>0.05) difference among strata means for each size class.

Pool riparian cover did not differ ($F=2.0$, $P=0.14$) among strata and ranged from 20 cm in stratum\3 to 89 cm in stratum 5 (Fig. 7). Pool riparian cover, expressed as percent of stream width, differed ($F=3.1$, $P=0.04$) among strata and ranged from 2% in stratum 3 to 15% in stratum 6. Strata 5 and 6 each had significantly more riparian cover than strata 2 or 3.

Fish Community Inventory

Total Density and Relative Abundance

Fish densities (all species combined) were highest in strata 4 and 5 and lowest in stratum 2 (Fig. 8). Total fish densities were similar among strata 1, 3, and 6.

Relative abundance of age 0+ chinook salmon ranged from <5% of total fish abundance in stratum 2 to 80% of total fish abundance in stratum 5 (Fig. 8). Relative abundance of age 0+ chinook salmon was higher than other species-age classes in strata 4 and 5. Relative abundance of age 0+ steelhead/rainbow trout was high in all strata except stratum 5 (< 8%) and ranged from 20% (stratum 1) to 45% (stratum 2). Relative abundance of adult mountain whitefish was high (20 to 25%) in strata 1,2,3 and 6.

Densities

Age 0+ chinook salmon. Densities did not differ ($F=1.7$, $P=0.19$) amonq strata and ranqed from 0.00064 fish/m^2 pool in stratum 2 to-0.16 fish/m^2 pool in stratum 5 (Fiq.. 9A).

Age 1+ chinook salmon: Densities did not differ ($F=2.2$, $P=0.10$) among strata. Density in stratum 5 was 0.005 fish/m^2 pool: densities were 0 fish/m' pool in other strata (9B).

Age 0+ steelhead/rainbow trout. Densities did not differ ($F=0.53$, $P=0.75$) among strata and ranged from 0.02 fish/m^2 pool in stratum 2 to 0.10 fish/m^2 pool in stratum 4 (Fig. 9C).

Age l+ steelhead/rainbow trout. Densities did not differ ($F=2.3$, $P=0.09$) amonq strata and ranaed from 0.02 fish/m^2 pool in stratum 1 to 0 fish/m^2 pool-in stratum 2 and 4 (Fig. 9D).

Age 2+ and older steelhead/rainbow trout. Densities did not differ ($F=0.9$, $P=0.51$) amonq strata and ranged from 0.0002 fish/m^2 pool in stratum 2 to 0.009 fish/m^2 pool in stratum 4 (Fia. 9E).

Age 2+ and older cutthroat trout. Densities differed /$F=3.34$, $P=0.03$) among strata and ranged from 0 fish/m^2 pool in strata 1,2,4 and 5 to 0.02 fish/m^2 pool in stratum 6 (Fig. 10 a Densities were significantly higher in stratum 6 than other strata, which did not differ sianificantlv.

Age l+ and older bull trout. Densities did not differ ($F=1.04$, $P=0.42$) among strata and ranged from 0 fish/m^2 pool in strata 1,2 and 6 to 0.002 fish/m^2 pool in stratum 5 (Fig.

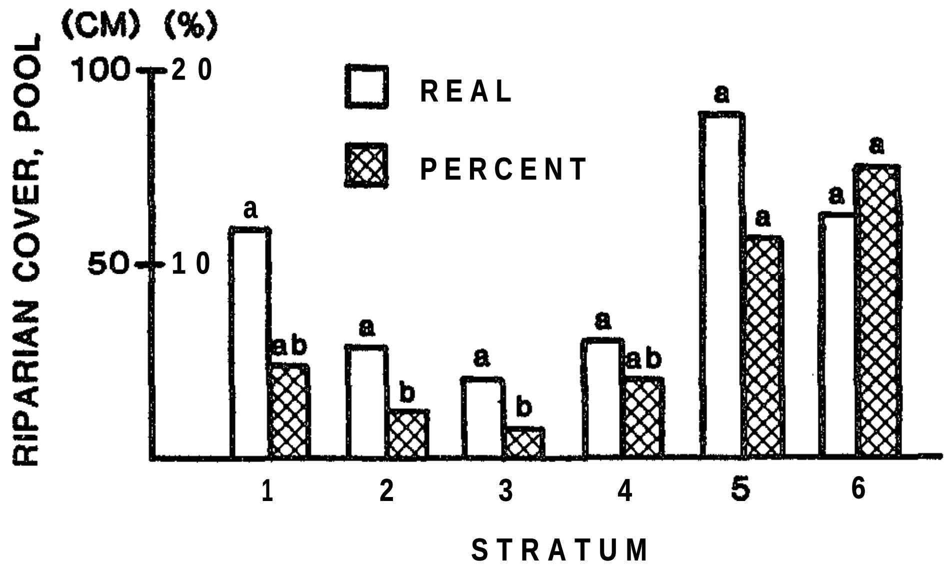


Figure 7. Mean (n=4 per stratum) riparian cover (real or measured and percent of pool width) by stratum, Yankee Fork of the Salmon River, Idaho, 1984. A common letter above means indicate a non-significant (P>0.05) difference among strata means within each method of measurement.

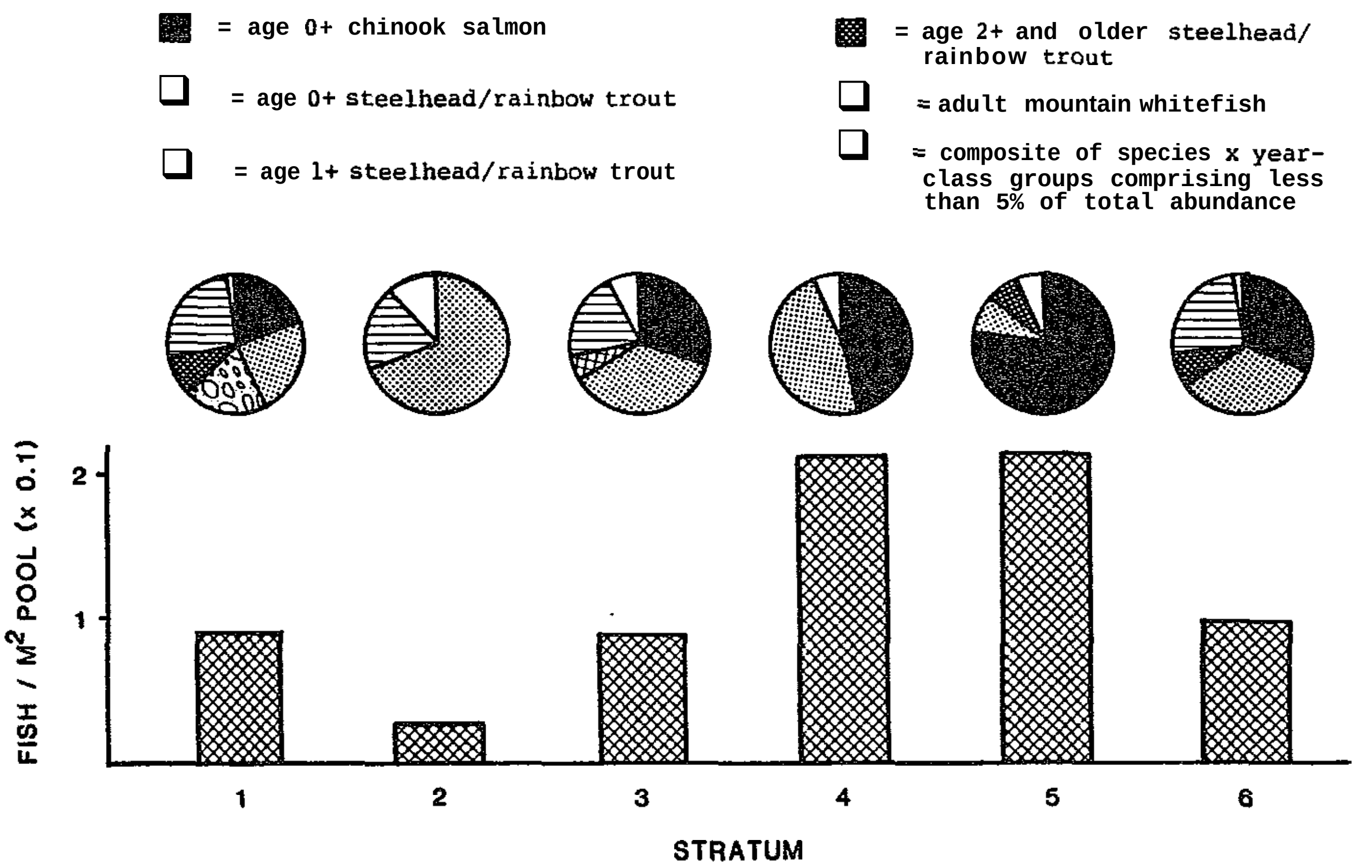


Figure 8. Mean (n=4 per stratum) fish densities of all species and age-classes (histogram) and relative abundance of species by age-classes (pie-chart) by stratum, Yankee Fork of the Salmon River, Idaho. 1984.

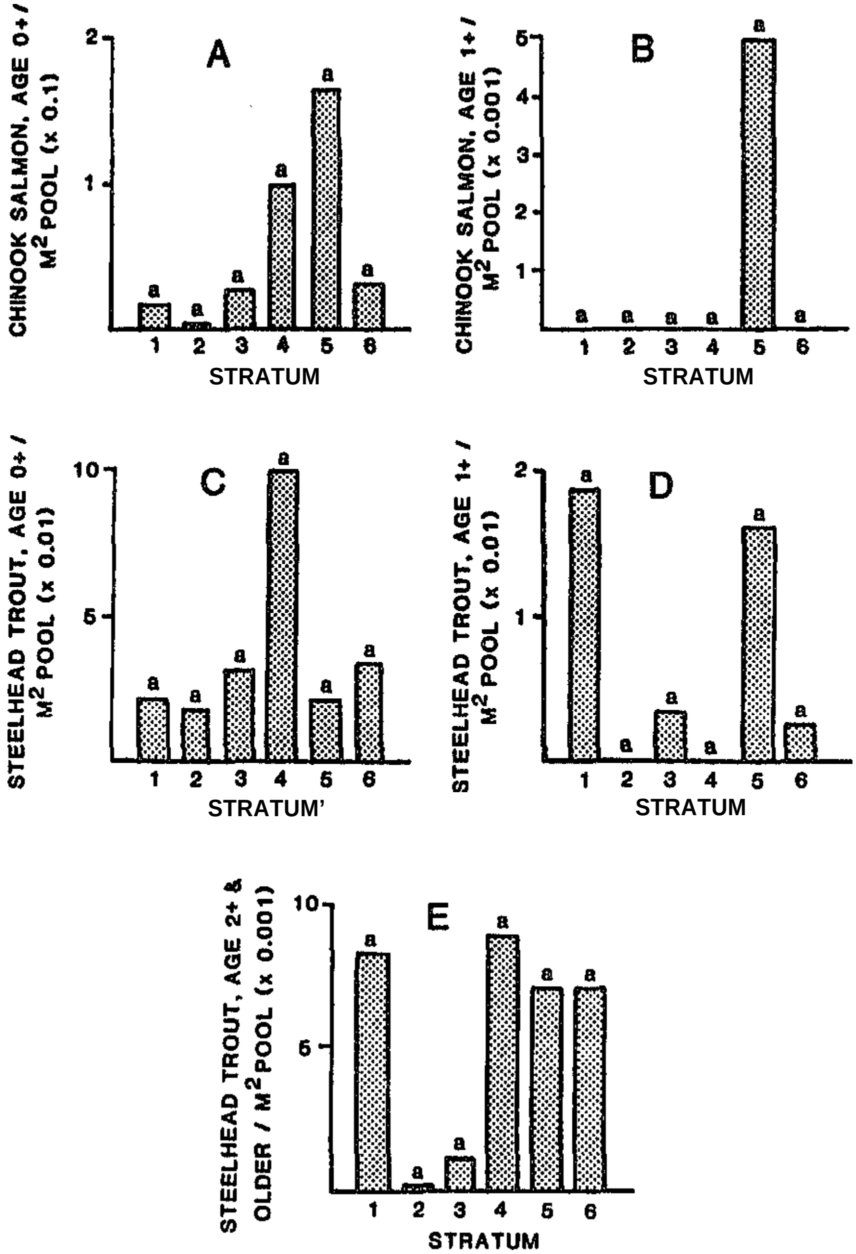


Figure 9. Mean (n=4 per stratum) densities of age 0+ (A) and age 1+ (B) chinook salmon, age 0+ (C), age 1+ (D) and age 2+ and older (E) steelhead/rainbow trout by stratum, Yankee Fork of the Salmon River, Idaho, during August, 1984. A common letter above means indicate a non-significant (P>0.05) difference among strata means.

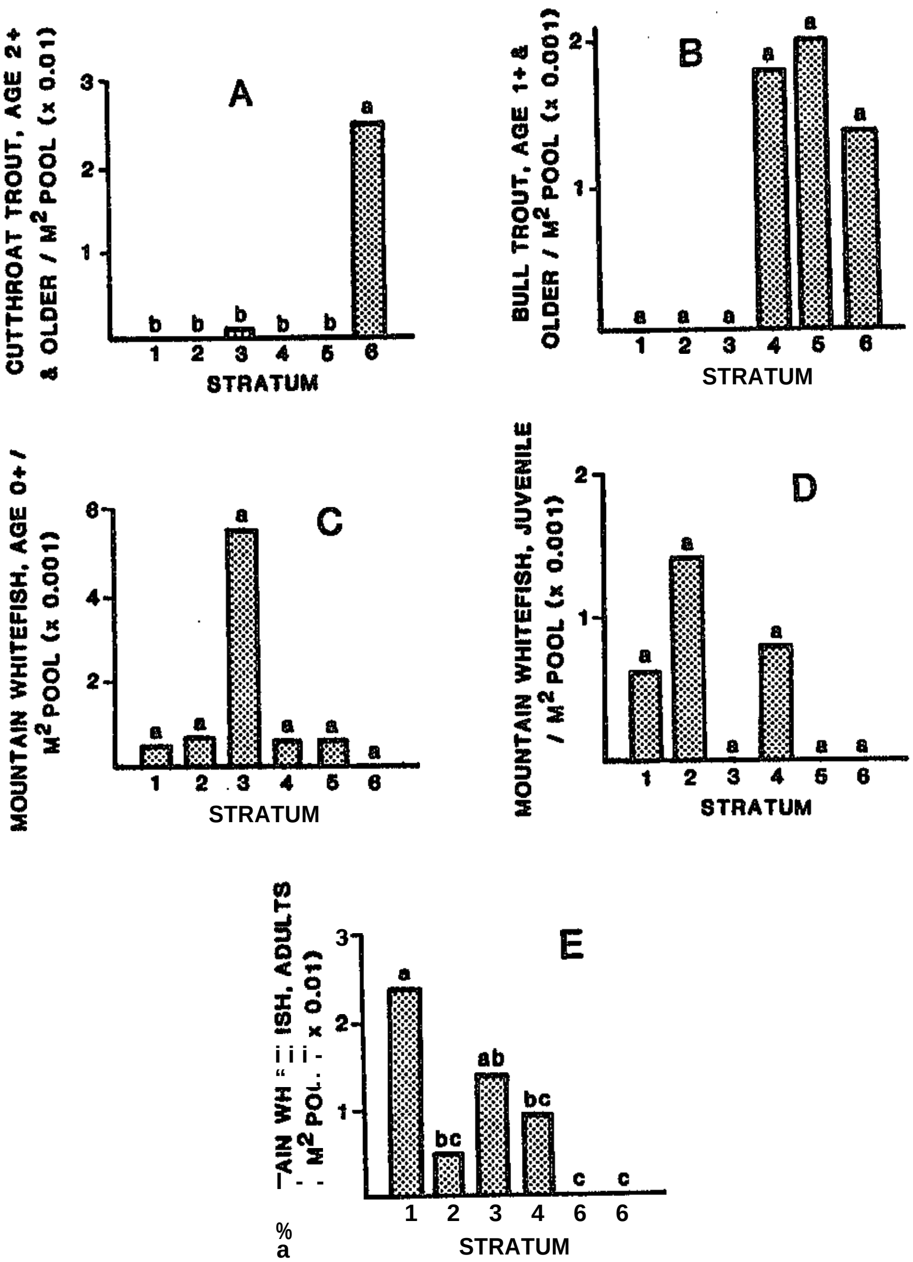


Figure 10. Mean (n=4 per stratum) densities of adult cutthroat trout (A), age l+ and older bull trout (B), and and age 0+ (C), juvenile (D) and adult (E) mountain whitefish, Yankee Fork of the Salmon River, Idaho, during August, 1584. A common letter above means indicate a non-significant (P>0.05) difference among strata means.

10B).

Age 0+ mountain whitefish. Densities did not differ ($F=2.01$, $P=0.13$) among strata and ranged from 0 fish/m' pool in stratum 6 to 0.005 fish/d pool in stratum 3 (Fig. 10C)

Juvenile mountain whitefish. Densities did.not differ ($F=0.67$, $P=0.65$) among strata and ranged from 0 fish/m^2 pool in strata 3, 5 and 6 to 0.001 fish/m^2 pool in stratum 2 (Fig. 10D).

Adult mountain whitefish. Densities differed ($F=4.68$, $P=0.007$) among strata and ranged from 0 fish/m^2 oool in strata 5 and 6 to 0.02 fish/m^2 pool in stratum l-(Fig. 10E). Densities did not differ significantly among: strata 1 and 3; strata 2,3 and 4; or strata 2,4,5 and 6. Density was significantly higher in strata 1 than strata 2,4,5 and 6; densities in stratum 3 was significantly higher than strata 5 and 6.

Age 0+ Chinook Salmon.

Total Length. Fish lengths (late August) ranged from 74 mm in stratum 1 to 90 mm in stratum 6 to (Fig. 11). Fish length increased from downstream to upstream strata except in stratum 4 (trend only).

Live weight. Fish weight (late August) ranged from 3.8 g in stratum 1 to 7.8 g in stratum 6 (Fig. 11). Weight increased from downstream to upstream strata except in stratum 4 (trend only).

Condition. Fish condition (late August) ranged from 0.94 in stratum 1 to 1.05 in strata 3 and 5 (Fig. 11). Condition was slightly higher in upstream (strata 3,4,5 and 6) than downstream (strata I. and 2) strata (trend only).

Abundance. Total number of fish in late August was 12,847 + 6,131 (95% confidence interval) (Fig. 12 and Table 6). Highest numbers (7,505 + 6,988) were observed in stratum 5. Lowest numbers (41 + 56)-were observed in stratum 2.

Reach Description and Problem Identification

Habitat Problem Types

Problems characteristic of the Yankee Fork system and which affect fish habitat include: dredge tailings, sloughing stream banks, roading, open slopes, washouts and barriers (Fig. 13). Dredge tailings were either barren of vegetation or had a thin buffer of vegetation next to the waters edge. Sloughing streambanks were of low (<1 m), medium (l-2 m) or high (>22 m) height and caused by natural or unnatural sources. Roads adjacent to the stream were either poorly rip-rapped, rip-rapped without vegetative cover or rip-rapped with vegetative cover. Open slopes adjacent to the stream had sparse vegetative cover or exposed soil. Washouts occurred in roaded sections, stream tributaries, and as a result of inadequate culverts. Barriers to fish passage (adult) include log jams and low flows.

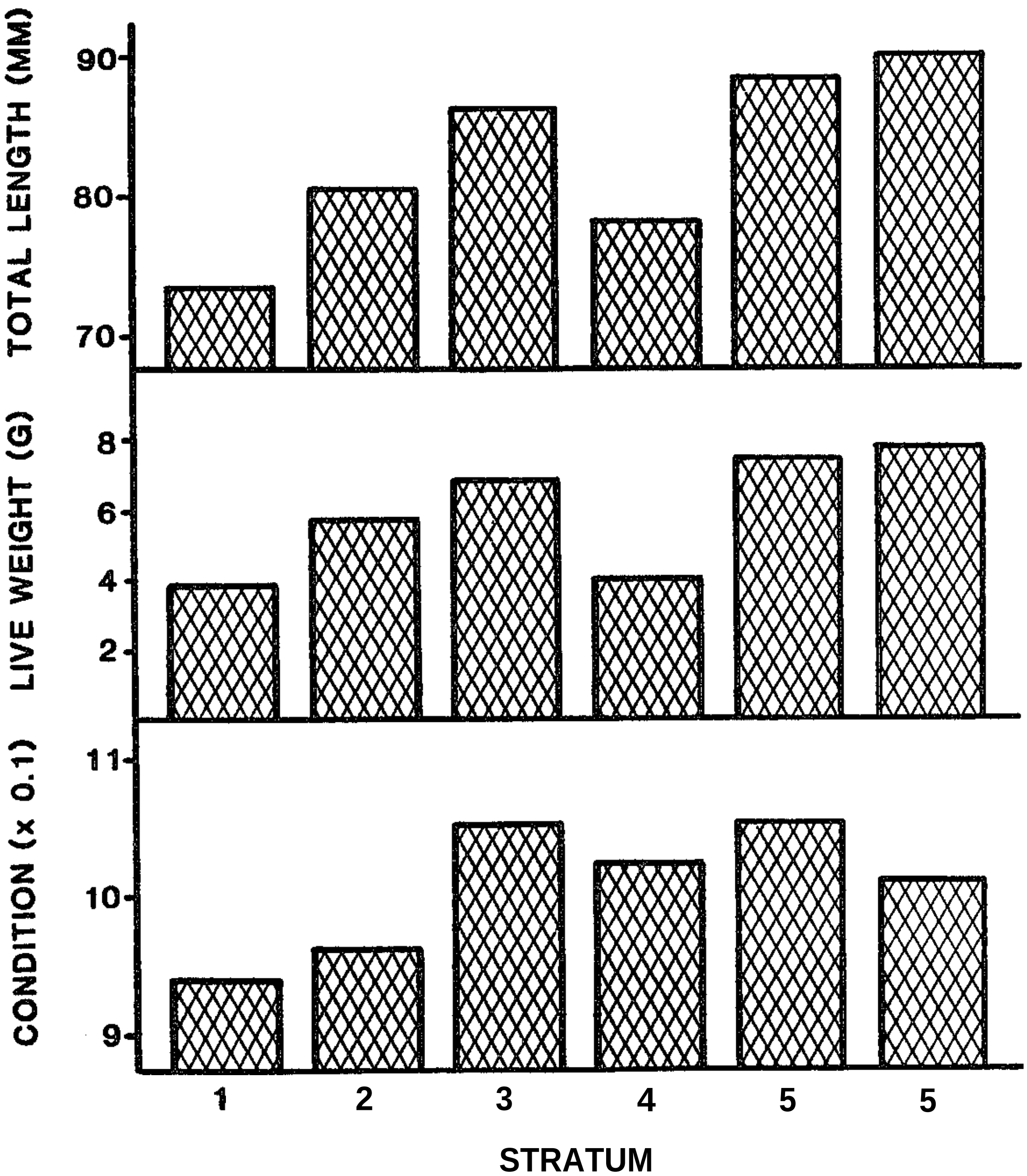


Figure 11. Mean total length, weight and condition of age 0+ chinook salmon by strata, Yankee Fork of the Salmon River, Idaho, 1984.

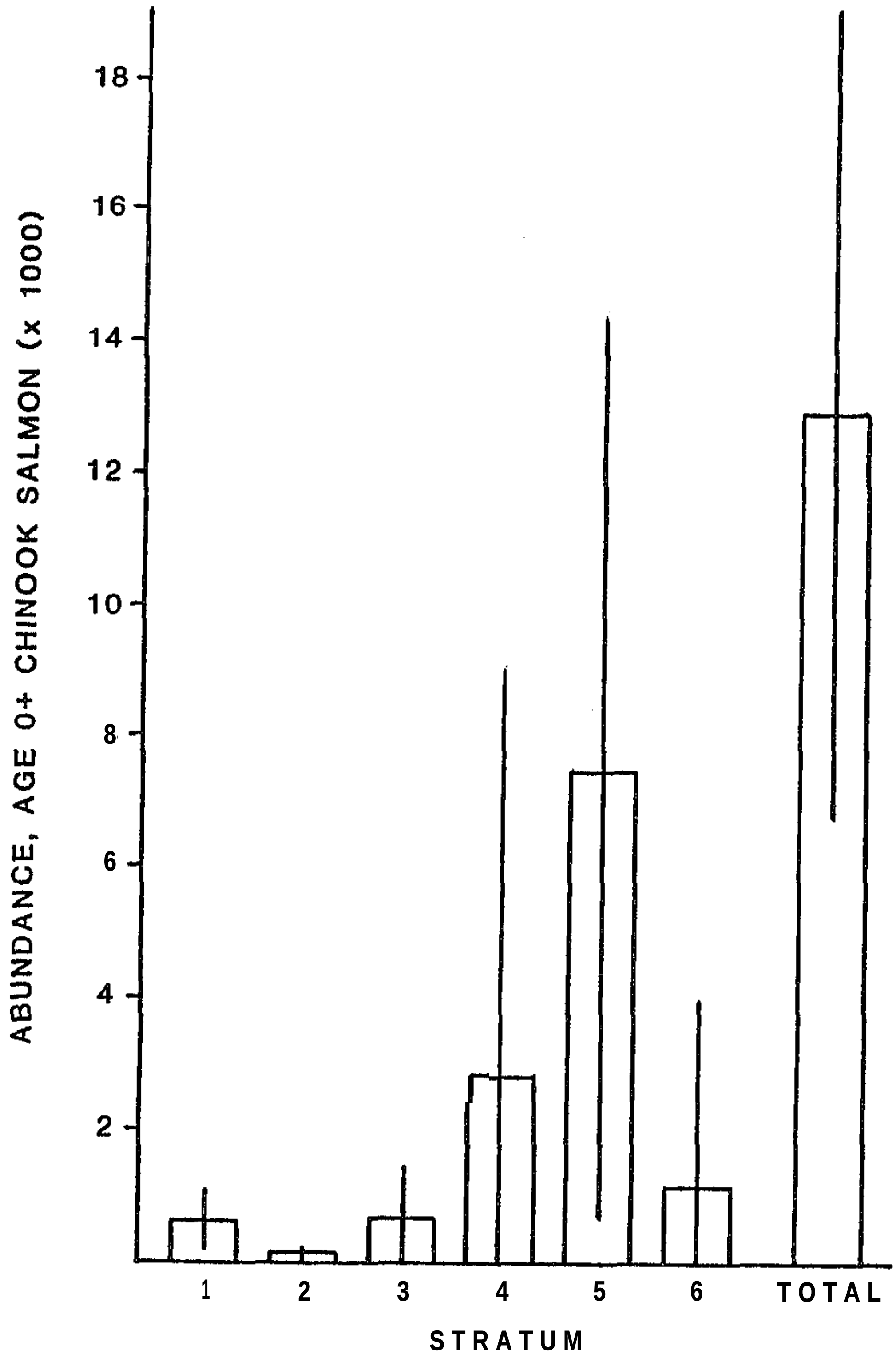
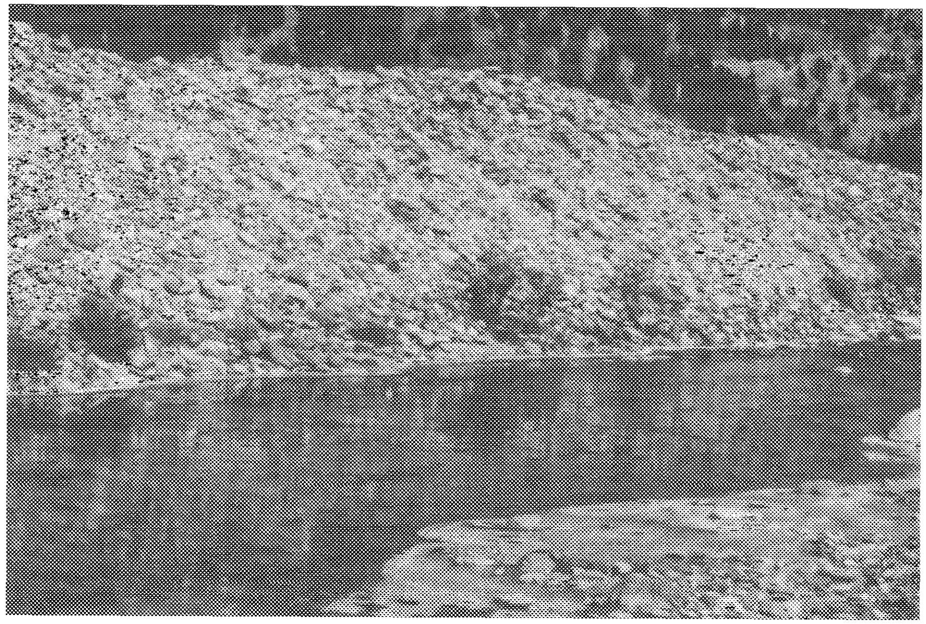


Figure 1.2. Estimated abundance of age 0+ chinook salmon by stratum and for the entire stream, Yankee Fork of the Salmon River, Idaho, during August, 1984. Vertical lines represent 95% confidence intervals.

Table 6. Abundance and associated 95% bounds of age 0+ chinook salmon in strata of the Yankee Fork of the Salmon River, Idaho, 1984.

Stratum		Abundance		
Number	Length (km)	Estimate	Bounds	Percent of total
1	5.5	596	274-918	5
2	6.0	41	6-76	0
3	3.8	593	55-1131	5
4	11.8	3083	O-6840	24
5	12.7	7505	3138-11872	58
6	9.6	1029	O-3029	8
Totals	49.4	12,047	6716-18,978	100



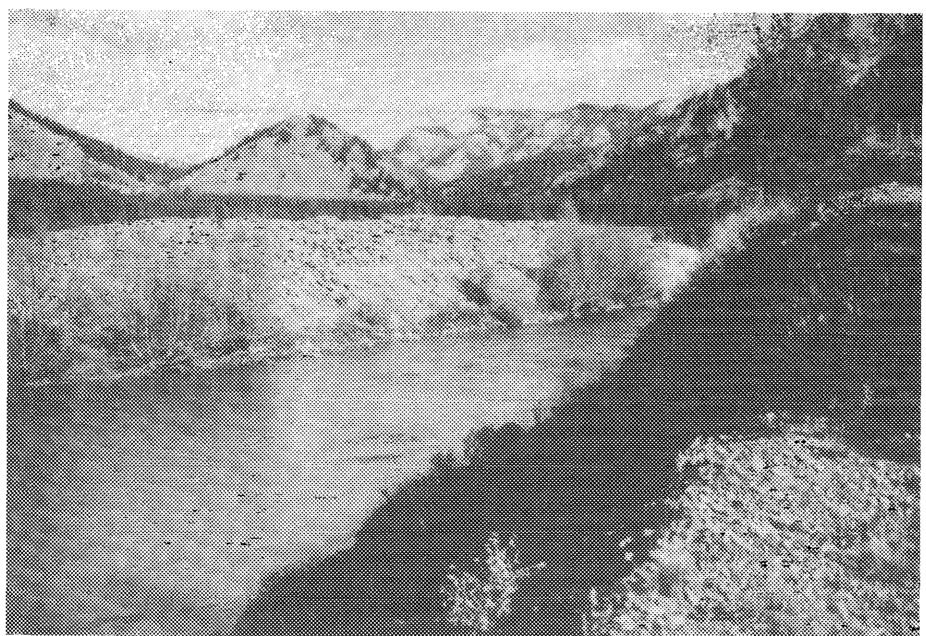
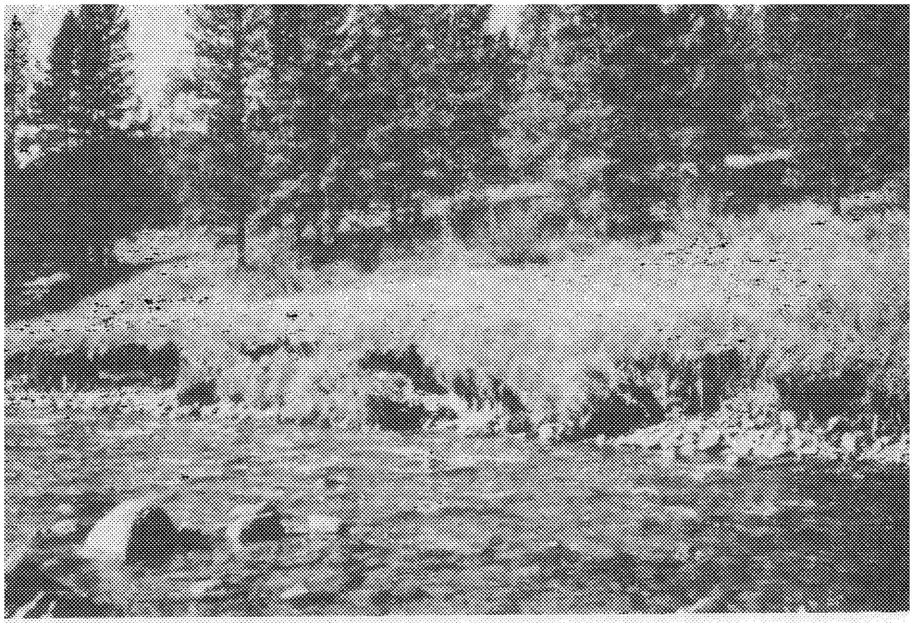


Figure 13. Habitat problem types in the Yankee Fork of the Salmon River drainage, Idaho, 1984. Upper: dredge tailings without vegetation. Lower: dredge tailings with vegetation.



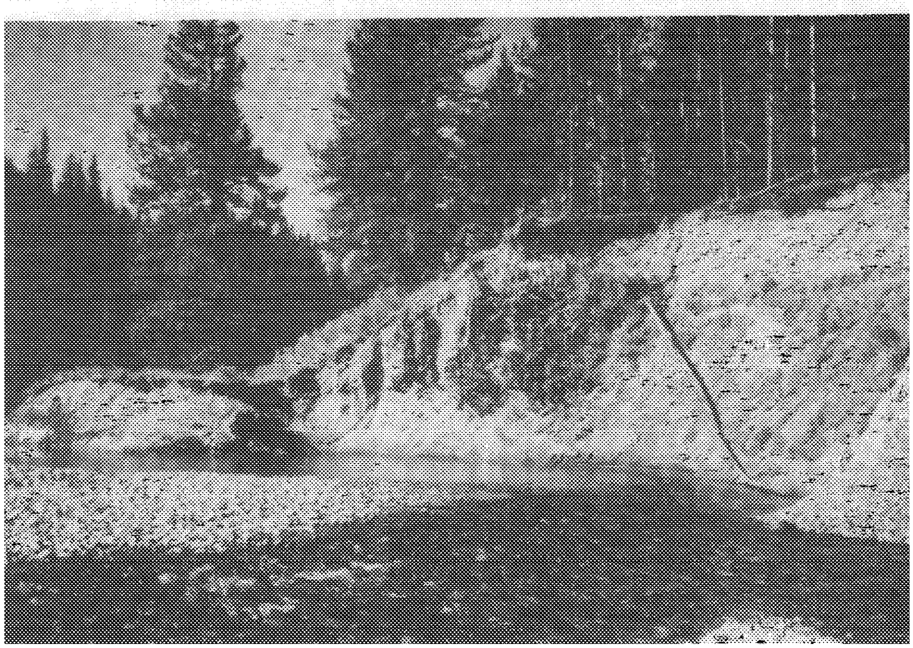
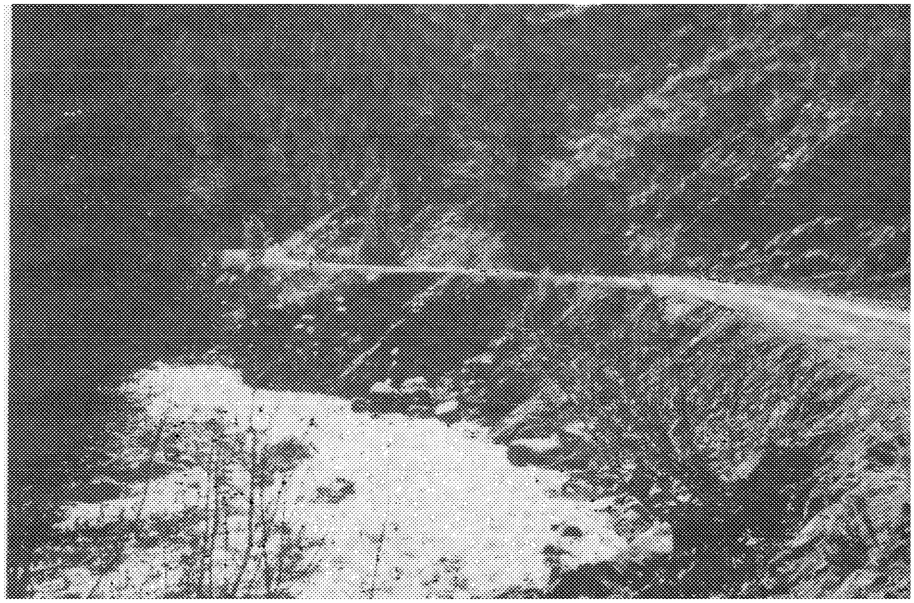


Figure 13. Continued. Upper: low sloughing stream bank.
Lower: medium (left) and high (right) sloughing stream bank.



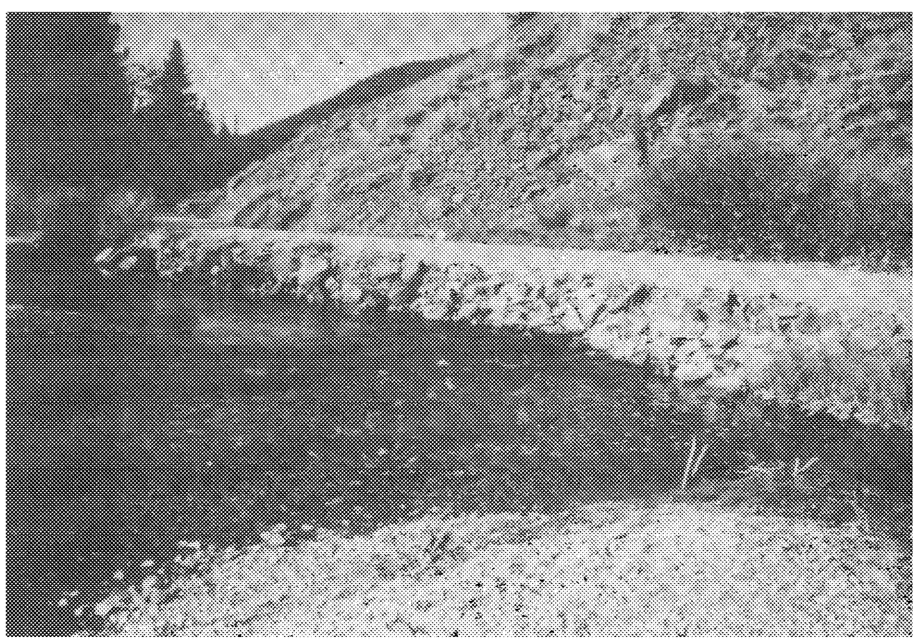
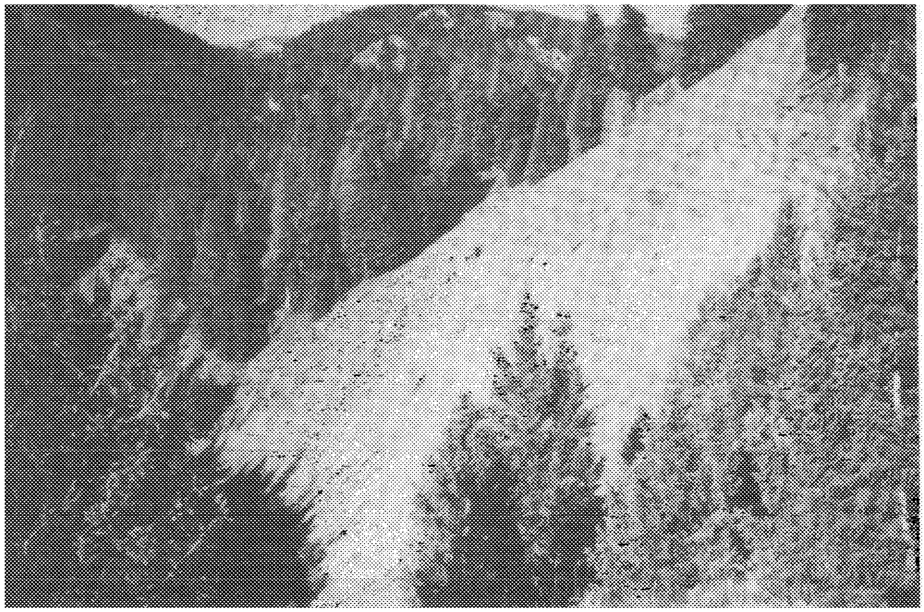


Figure 13. Continued. Upper: poorly rip-rapped road adjacent to stream. Lower: adequately rip-rapped road adjacent to stream.



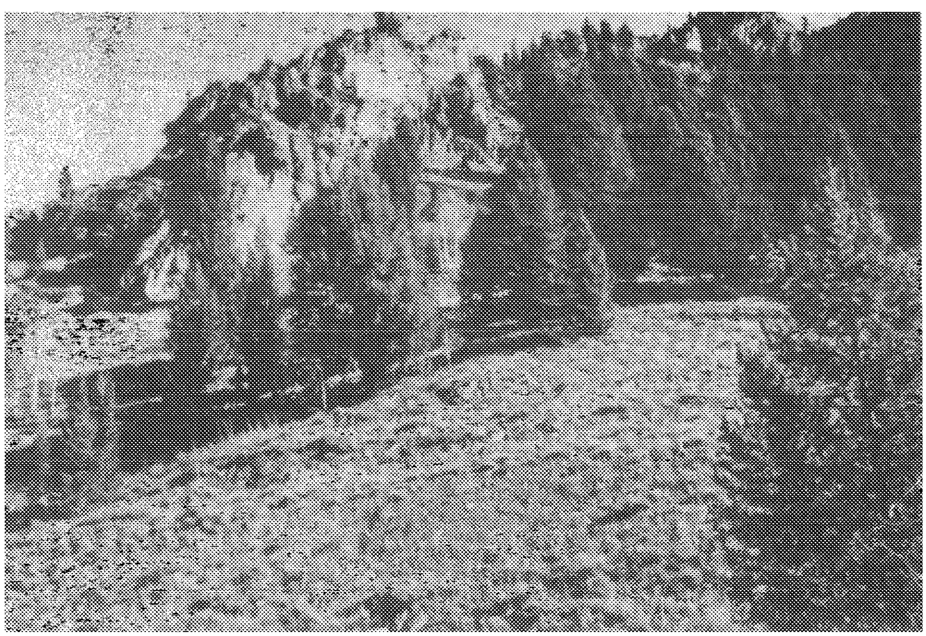
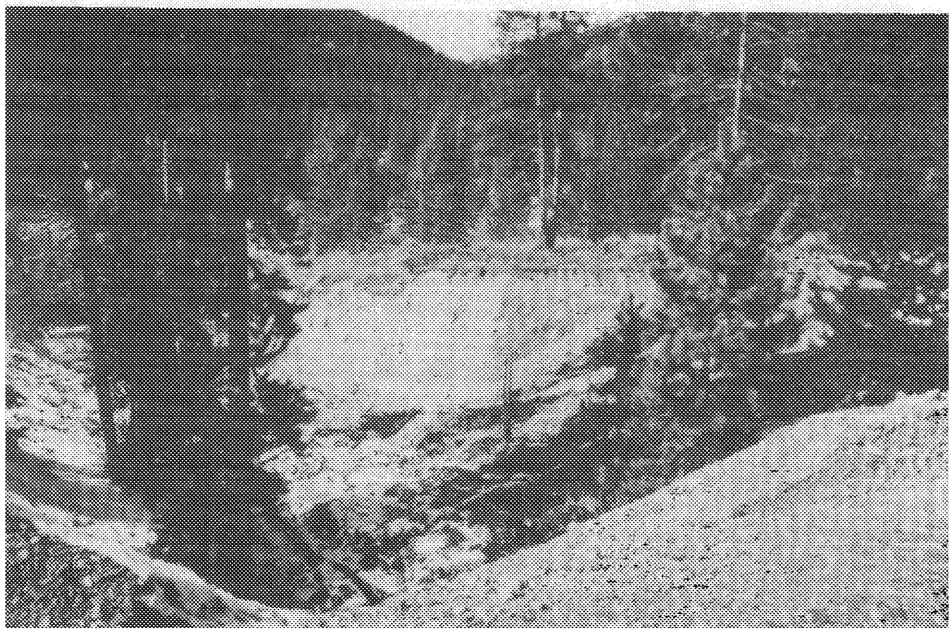


Figure 13. Continued. Upper: open slope with exposed soil. Lower: open slope with sparse vegetation.



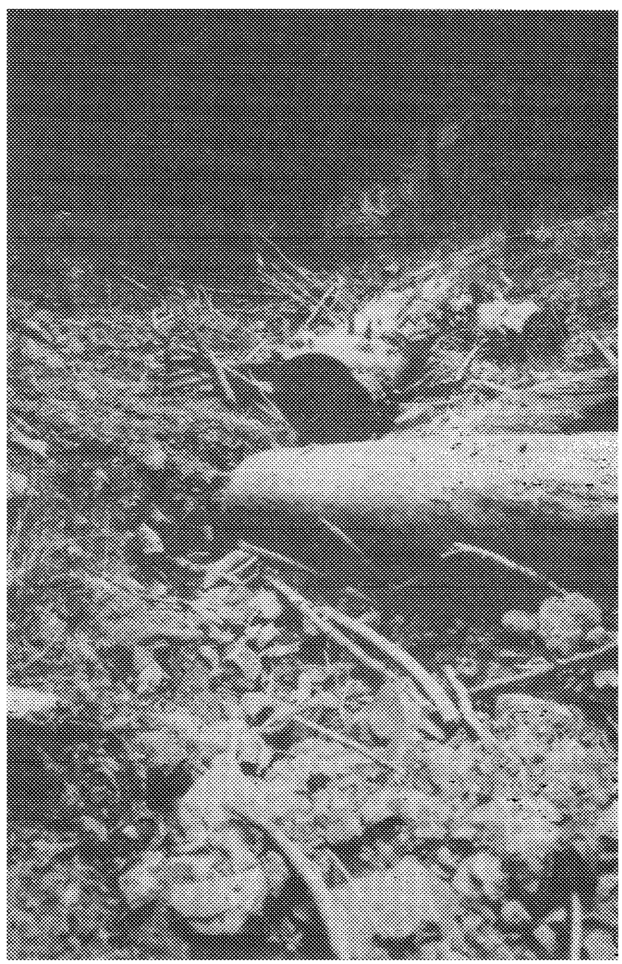
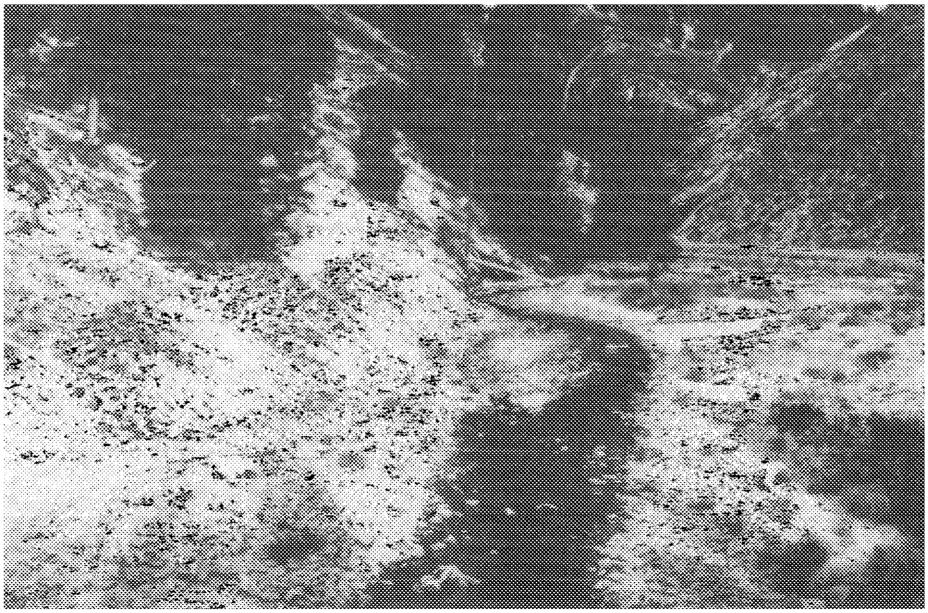


Figure 13. Continued. Upper: road washout. Lower: tributary stream washout.



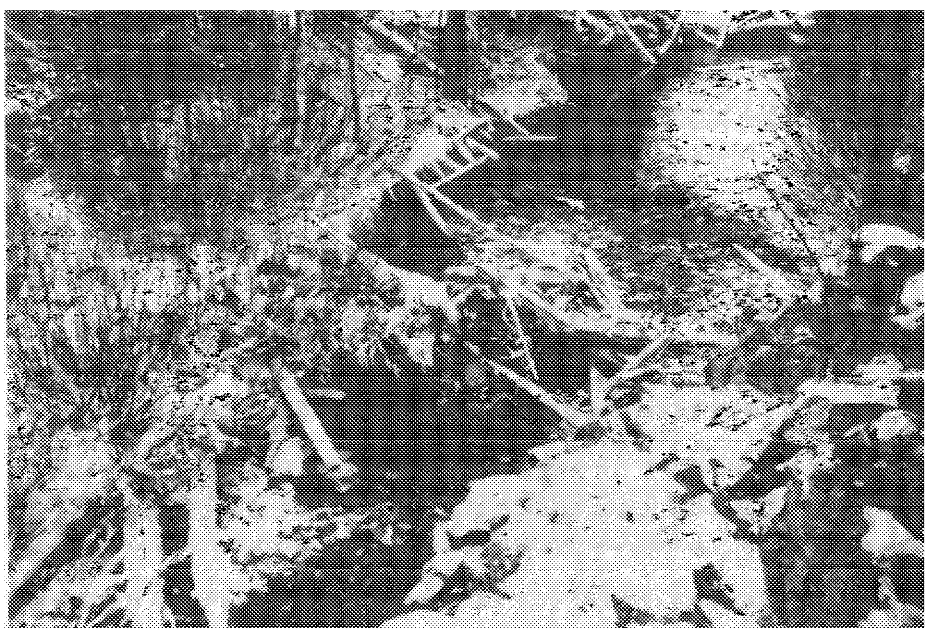


Figure 13. Continued. Upper: low flow adult passage barrier. Lower: log-jam adult passage barrier.

Reach A

Reach A (stratum 1) extends from the confluence of the Yankee Fork with the Salmon River to the downstream boundary of the dredge tailings (5.45 km) (Fig. 1). The stream flows with moderate-gradient through a narrow canyon of steep scree slopes and sparse forest. A road is adjacent to the stream along the entire reach.

Stream habitat is dominated by pocket water and pools. Pocket water areas have high velocity flows cascading over boulder and bedrock substrates coated with a thin layer of silt and algae. Spawning potential is poor and confined to small isolated areas of cobble and gravel. Pools have adequate instream cover (depth, boulder and turbulence) for rearing salmonids. Riparian cover is poor and limited to sparse vegetation and shoreline boulders.

Problems in Reach A which affect fish habitat include sections of the road adjacent to the stream (1300 m) and unstable open slopes adjacent to the stream (1390 m) (Table 7). These problems are sources of in-reach sedimentation, however, upstream problem areas also input sediment into the reach.

Reach B

Reach B (strata 2 and 3) extends from the downstream boundary of the dredge tailings upstream to the confluence of Jordan Creek with Yankee Fork (9.73 km) (Fig. 1). The stream flows with low gradient through a wide valley of dredge tailings. A road exists along the entire length of the stream (adjacent to stream for short distances only). Upland areas have moderate to steep slopes of forest or grass and sagebrush.

Stream habitat is dominated by riffles and pools. Riffles have fair spawning potential with cobble-gravel substrate coated with a thin to medium layer of silt and algae. Pools have poor instream cover (depth only) and riparian cover (sparse vegetation).

Problems in Reach B which affect fish habitat include: unstable dredge tailings adjacent to the stream (5620 m), sloughing stream banks (1260 m), road (85 m) and culvert (1 occurrence) washouts, and sections of the road adjacent to the stream (900 m) (Table 8).

Reach C

Reach C (Stratum 4) extends from the confluence of Yankee Fork with Jordan Creek to the confluence of Yankee Fork with Eightmile Creek (11.81 km) (Fig. 1). Throughout most of this reach, the stream flows with moderate gradient through a moderately wide valley. The stream flows with high gradient through a narrow canyon for a short distance near the middle of the reach. The entire reach is roaded, occasionally adjacent to the stream. Upland areas have moderate to steep slopes of dense forest or grass and sage.

Table 7. Identification, extent, sediment input (relative to other reaches), and priority for remediation of habitat problems in Reach A (Stratum 1) Yankee Fork of the Salmon River, Idaho, 1984.

Problem type	Length (m)	Percent Of total length (10,900 m)[a]	Ranking of potential sediment input	Priority for remediation
open slopes				
exposed soil	1390	13	1	4
Adjacent road				
riprapped	819	8	2	1
poorly riprapped	413	4	3	2
riprapped/vegetated	64	1	4	3

a total length represents the length of streambank in reach (two times the length of reach.

Table 8. Identification, extent, sediment input (relative to other reaches), and priority for remediation of habitat problems in Reach B (strata 2 and 3) Yankee Fork of the Salmon River, Idaho, 1984.

Problem type	Length (m)	Percent of total length[a] (19,440 m)	Ranking of potential sediment input	Priority for remediation
Dredge tailings				
without vegetation	2438	12.5	1	1
with vegetation	3180	16.4	2	4
Sloughing banks				
low, natural	233	1.2	10	10
medium, natural	138	0.7	9	8
medium, unnatural	64	0.3	11	7
high, natural	265	1.4	4	6
high, unnatural	562	2.9	3	2
Adjacent road				
poorly riprapped	307	1.6	5	3
riprapped	407	2.1	7	11
vegetated	117	0.6	13	12
open slopes				
exposed soil	170	0.9	8	14
sparse vegetation	710	3.7	6	13
Washouts				
road	85	0.4	12	5
culvert	1[b]	NA	14	9

[a] total length represents the length of streambank in reach (two times the length of reach).

[b] frequency of occurrence.

Stream habitat is dominated by riffles and pools, although stretches of pocket water are also present. Riffles contain high' quality gravels for spawning but riffle substrates are coated with a thin layer of silt and algae. Spawning potential in pocket water is poor. Pools have adequate instream and riparian cover for rearing salmonids. Instream cover is in the form of depth, boulders, and turbulence. Riparian cover is provided from willows, alders and undercut banks.

Problems in Reach C which affect fish habitat include: sloughing stream bamks (2792 m); steep, unstable open slopes adjacent the the stream (1960 m); roading adjacent to the stream (497 m) unstable dredge tailings adjacent to the stream (42 m); road (32 m), culvert and tributary (1 occurrence each) washouts (Table 9).

Reach D

Reach D (Stratum 5) extends from the mouth of the West Fork of Yankee Fork upstream to the confluence of Cabin Creek with the West Fork (12.7 km) (Fig. 1). The stream flows with moderate gradient through narrow, forested or wide, meadow valley sections. The reach is unroaded except at the lower end. Upland areas have moderate to steep forested and open slopes.

Stream habitat is dominated by riffles and pools. Riffles contain high quality gravels for spawning, with minimal siltation apparent. Pools have adequate instream cover (depth, boulders and logs) for rearing salmonids. Riparian cover is good and ranges from undercut banks of grasses and forbs in meadow sections to alders and pines in canyon sections.

Problems in Reach D which affect fish habitat include: steep open slopes adjacent to the stream (820 m), sloughing stream banks (680 m) tributary stream washout (1 occurrence), and dredge tailings adjacent to the stream (370 m) (Table 10).

Reach E

Reach E (Stratum 6) extends along Jordon Creek from the confluence of Jordan Creek with Yankee Fork to the Loon Creek Summit road (9.60 km) (Fig. 1). Throughout most of the reach, the stream flows with moderate gradient through a narrow forested valley. Short sections of the stream flow with high gradient through narrow canyons of exposed bedrock. The stream flows through dredge tailings near the stream mouth and in isolated upstream sections.

Stream habitat is dominated by pocket water and, to a lesser extent, riffles and pools. Spawning potential is poor in pocket water areas (large substrate and high velocity flow). Where riffles are present, gravels are of high spawning quality. Pools have adequate instream cover (boulders and turbulence) although depth may be inadequate in sections of the stream for rearing salmonids. Riparian cover

Table 9. Identification, extent, sediment input (relative to other reaches), and priority *for* remediation of habitat problems in Reach C (Stratum 4), Yankee Fork of the Salmon River, Idaho, 1964.

Problem type	Length (m)	Percent of total le"gth (23,624 m)[a]	Ranking of potential sediment input	Priority for remediation
Sloughing banks				
low, natural	53	0.2	13	12
medium, natural	596	2.5	4	4
medium, unnatural	851	3.6	2	2
high, natural	649	2.8		3
high, unnatural	*643*	*2.7*	*3*	1
open slopes	64			
exposed soil	1957	*0.3*	10	15
sparse vegetation		*6.3*	1	14
Adjacent road		1.4		
poorly riprapped	*327*	0.1	*6*	5
riprapped	1::	[illegible]	14	13
vegetated		0.7	7	11
Dredge tailings				
without vegetation	*42*	*0.2*	*3*	*6*
Washouts				
road	*32*	0.1	8	7
tributary stream	1h	*NA*	11	10
culvert	1[b]	*NA*	*12*	8
Stranded pools	5[b]	NA	NA	3

[a] total length represents the length of streambank in reach (two times the length of reach).

[b] frequency of occurrence, not length.

Table IO. Identification, extent, sediment input (relative to other reaches). and priority for remediatio" of habitat problems in Reach D (Stratum 5), Yankee Fork of the Salmon River, Idaho, 1984.

Problem type	Length (m)	percent of total length (25,318 m[a])	Ranking of potential sediment input	Priority for remediation
open slopes				
exposed soil	616	3.2	1	8
sparse vegetation	53	0.2	9	9
Sloughing banks				
low, natural	233	0.9	6	6
medium, natural	276	1.1	2	5
medium, unnatural	138	0.6	4	4
high, unnatural	32	0.1	5	3
Dredge tailings				
without vegetation	56	0.2	7	1
with vegetation	307	1.2	3	2
Washouts				
tributary stream	1[b]	NA	8	7

[a] total length represents the length of streambank in reach (two times the length of reach).

b frequency of occurrence, not length.

is good (undercut banks and alder, willow and pine) except in the lower most section of the reach which runs through dredge tailings.

Problems in Reach E which affect fish habitat include: unstable dredge tailings adjacent to the stream (4823 m), tributary stream (8 occurrences) and culvert (4 occurrences) washouts, roading adjacent to the stream (689 m), steep slopes with sparse vegetation adjacent to the stream (339 m), sloughing stream banks (308 m) and low flows (360 m) (Table 11).

Table 11. Identification, extent, sediment input (relative to other reaches), and priority for remediation of habitat problems in Reach E (Stratum 6), Yankee Fork of the Salmon River, Idaho, 1984.

Problem type	Length (m)	Percent Of total length (19,208 m[a])	Ranking of potential sediment input	Priority for remediation
Dredge tailings				
without vegetation	4611	24.0	1	1
with vegetation	212	1.1	9	12
Adjacent road				
poorly riprapped	562	2.9	2	3
riprapped	127	0.7	7	11
open slopes				
sparse vegetation	339	1.8	6	13
Sloughing banks				
medium, natural	21	0.1	10	9
high, natural	170	0.9	4	8
high, unnatural	117	0.6	3	4
Washouts				
road	12	0.1	11	6
tributary stream	8[b]	NA	5	7
culvert	1[b]	NA	8	5
Barriers				
low flows	360	1.9	NA	2
log jams	1[b]	NA	NA	10

[a] total length represents the length of streambank in reach (two times the length of reach,.

[b] frequency of occurrence.

DISCUSSION

Habitat Inventory

Water temperature ranged from 0 to 14C during September (Table 5). Temperature extremes probably occurred for only short periods of time during a die1 cycle. These temperatures did not appear to limit growth or survival of chinook salmon (preferred temperature range: 7 to 15 c; Reiser and Bjornn 1979), although maximum seasonal water temperatures probably occurred in August, which were not monitored.

September flows ranged from 0.3 m^3/second in Jordan Creek (stratum 6) to 3 m^3/second in the lower mined section (stratum 2) (Fig. 3A). Flow did not limit chinook salmon passage or survival during September throughout most of the drainage. Adult passage may be restricted near the mouth of Jordan Creek as a result of flow (<0.20 m water depth) moving underground (through interstitial spaces in tailings). Adult spring chinook require water depths of at least 0.24 m for adequate passage (Thompson 1972).

The quality of riffles and pools for spawning and rearing probably limit potential chinook salmon production. Riffles which contain large amounts of pocket water habitat with large substrate and high velocities may reduce spawning potential in stratum 1 (Fig. 5). Most riffle substrates in the Yankee Fork system were of the cobble-gravel size preferred by anadromous salmonids (6-102 mm; Reiser and Bjornn 1979). Inundation of riffles with fine sediments was minimal throughout the Yankee Fork system (< 10%) and did not pose a limitation to spawning and emergence of anadromous salmonids (Fig. 6A). Riffles with less than 20% fines (<6.4 mm diameter) do not usually have adverse affects on spawning success (Bjornn et al. 1977). Many (10 to 38%) riffle substrate particles were coated with a thin to moderate layer of silt and algae which could reduce emergent fry survival (Fig. 6B). Sedimentation of pool rearing areas was minimal (< 21%) except in stratum 2 (60%) and did not pose a major limitation to rearing potential (Fig. 4D). Riparian cover was poor (< 30 cm) in the dredge-mined sections (strata 1 and 3) because of unvegetated and unstable stream banks (Fig. 7). Riparian cover was good (90 cm) in the West of the Fork Yankee Fork (stratum 5) and fair (70 cm) in Jordan Creek (stratum 6).

Fish Community Inventory

Density of fish (combined species and age-classes) was highest (2.2 fish/m* pool) in strata 4 and 5, and lowest (0.3 fish/m^2 pool) in stratum 2 (Fig. 8). Relative abundance of age 0+ chinook salmon ranged from less than 5% in stratum 2 to 80% in stratum 5. Other strata had less than 30% age 0+ chinook salmon except stratum 4 (45%). Relative abundance of age 0+ steelhead/rainbow trout was high (25-70%) in all strata except stratum 5 (12%) primarily because of outplanting by the Idaho Department of Fish and Game.

Densities of age 0+ chinook salmon in the Yankee Fork ranged from 0.02 fish/m^2 pool in stratum 2 to 0.18 fish/m^2 pool in stratum 5 (Fig. 9A). These densities are well below rearing potential (0.3 to 1.7 fish/m^2 pool) typical of Idaho streams (Sekulich and Bjornn 1977; Bjornn 1978). Total abundance of age 0+ chinook salmon in late August was estimated at 12,850 fish (Table 6).

Predation of juvenile anadromous salmonids by piscivores was probably low throughout the system. Highest potential for predation occurred from adult rainbow trout in strata 1,2 and 3 (Fig. 9E) and from adult cutthroat trout in stratum 6 (Fig. 10A). Densities of these fish was low (<0.03 fish /m2 pool) and sympatry with age 0+ chinook salmon appeared minimal (Fig. 9A). Potential predation on age 0+ Steelhead/rainbow trout may be higher as a result of a more proximal association with potential piscivores (Fig. 9C).

Intra- and interspecific competition for food and space was probably minimal for anadromous salmonids. Low fish numbers and an apparent abundance of suitable habitat preclude adverse competition effects on age 0+ chinook salmon and steelhead trout.

Effectiveness of Sampling Design and Sampling Methods

The sampling design used to inventory fish populations and their habitats in the Yankee Fork drainage during 1984 provided only low confidence in most estimates. Samples were collected from 4 sites within each of 6 strata (24 sites total) to estimate most biological and habitat variables. As a result of high variability associated with sampling, low precision was associated with the estimates. Differences in mean fish densities of nearly 100% were often necessary to discern statistical differences among strata (Figs. 9 and 10). Strata means for habitat variables required differences from 30 to 70% to discern statistical differences (Fig. 4).

The 1984 sampling design would not be intensive enough to evaluate treatment effects over time between strata. Data collected from 24 sites to estimate age 0+ chinook salmon numbers produced a 48% estimation error for the total estimate (Table 6). Thus, age 0+ chinook salmon numbers must change approximately 96%, given the same precision in some future year, to attribute that response to enhancements. To associate responses within strata (n=4) to treatment effects, fish numbers will have to change 174 to 622% depending on the stratum (Table 6). Furthermore, the intensity of our sampling design would provide only minimal sensitivity to changes in fish numbers. For evaluation purposes, a pretreatment sampling design of at least 6 sites per stratum is recommended to discern treatment effects within strata between years.

Reach Description and Problem Identification

Reach A

Reach A (stratum 1) is a roaded canyon section of lower Yankee Fork. Spawning potential for anadromous salmonids is poor as a result of pocket water, cascades and few riffles. Adequate instream cover and poor riparian cover result in fair rearing potential for anadromous salmonids.

Recruitment of sediment into Reach A was predominantly from natural open slopes with exposed soil and erosion from mining activities upstream (Table 7). These problems cannot be realistically remedied in Reach A. Unstable banks resulting from roading adjacent to the stream could be rip-rapped to decrease sedimentation, however, this problem probably has a minimal impact on stream habitats.

Reach B

Reach B (strata 2 and 3) is the dredge-mined section of Yankee Fork, located in a wide, roaded valley. Spawning potential for anadromous salmonids was only fair to good because of a layer of silt and algae that covered the cobble-gravel substrate. Poor instream and riparian cover resulted in poor rearing potential for anadromous salmonids.

Problems affecting fish habitat were extensive in the reach and were associated primarily with sedimentation and a paucity of riparian cover resulting from unnatural causes (Table 8). Erosion of unstable dredge tailings adjacent to the stream was probably the major source of sedimentation in this reach. The majority of the tailings were cobble and boulder with relatively minimal erosion and sedimentation potential, but the cummulative sedimentation effect was probably high from the extensive nature of tailings in the reach. Most tailings were barren of vegetation which reduces bank stability and riparian cover. Remediation of the problem would involve laying back the steep dredge piles and stabilization with geotextile cloth, sod, and vegetation. Sloughing of high stream banks which result from unnatural causes (mining related) probably contribute relatively high amounts of fines into the stream. Streambanks were nearly vertical and usually leveled off to a wide plateau with sparse vegetation. Remediation would require laying back and revegetating the banks. Areas of lesser importance and priority for remediation include: poorly rip-rapped sections of road adjacent to the stream, which should be rip-rapped with larger materials at a less steep angle: high sloughing streambanks of natural origin, which should be tapered and revegetated; and, road and culvert washouts, which should be rip-rapped and adequate culverts installed.

Reach C

Reach C (stratum 4) is located mostly in a roaded valley of medium width in the upper section of Yankee Fork.

Spawning potential was fair to good because of a mix of pocket water and high quality spawning riffles of cobble-gravel. Instream and riparian cover was adequate throughout most of the reach.

Problems affecting fish habitat were moderate in the reach and were primarily associated with sediment recruitment from natural and unnatural sources (Table 9). Erosion from high sloughing stream banks (natural and unnatural) was probably the major source of sedimentation in the reach. Medium height natural and unnatural sloughing stream banks also contribute high amounts of sediment into Yankee Fork. Remediation of these problems require tapering and revegetation of stream banks. Priority should be given to high and medium height unnatural sloughing banks, followed by high natural sloughing banks. Poorly rip-rapped sections of road adjacent to the stream probably contribute to sedimentation problems. Most of these areas should be rip-rapped with larger material at a less steep angle. A culvert and road washout probably recruits minimal amounts of sediment into the stream but should be remedied (rip-rapping and installing adequate culverts) before the situation worsens. Unstable open slopes with exposed soil adjacent to the stream are extensive in the reach and are probably a major source of sedimentation. Remediation of this problem, however, is not feasible. Several stranded pools ($\leq$ 15 m) were found in this reach during Septmber and contained up to 50 steelhead fry. These isolated low areas on the floodplain could be filled in to avoid unnecessary fish mortality.

Reach D

Reach D (stratum 5) includes West Fork Yankee Fork, most of which flows through a pristine forested and unroaded valley of moderate width. Spawning potential for anadromous salmonids was excellent because of abundant riffle areas of cobble-gravel and moderate water velocity. Rearing potential for anadromous salmonids was also excellent with abundant instream and riparian cover in well defined pools.

Problems affecting fish habitat were minimal in this reach and were primarily associated with sediment recruitment from natural sources (Table 10). The major source of sediment recruitment in this reach was natural open slopes with exposed soil adjacent to the stream. Although this problem was not extensive, certain areas probably input substantial amounts of sediment into the stream. Remediation of this problem is not feasible, which accounts for the low priority ranking. The lower portion of this reach flows through dredge tailings, most of which contain some cover (vegetation) adjacent to the stream. This source of bank instability and sedimentation should be corrected by tapering the tailings, sodding, and revegetation. Sloughing banks were not extensive in the reach but could be stabilized by tapering and revegetation to reduce sedimentation. Priority should be given to high and medium high sloughing banks of unnatural origin. Most of these areas were accessible. Medium height sloughing stream banks of natural origin were low priority because accessibility was poor. An ephemeral tributary stream washout should also be stabilized by vegetation to reduce sedimentation.

Reach E

Reach E (stratum 6) or Jordan Creek flows mostly through a narrow forested and roaded valley. Spawning potential for anadromous salmonids was poor throughout the majority of the reach because of the predominance of pocket water habitat with large substrate and high water velocities. Scattered sections of quality spawning riffles with gravel and small cobble substrates occurred in the lower and upper ends of the reach. Rearing potential for anadromous salmonids was good throughout the majority of the reach with adequate instream and riparian cover. Lack of instream and riparian cover resulted in poor rearing potential in downstream dredge-mined sections of the stream.

Problems affecting fish habitat were extensive in Reach E and were primarily associated with sediment recruitment and a paucity of riparian cover from unnatural sources (Table 11). Erosion from unstable and unvegetated dredge tailings contributed the most sediment to the reach which resulted in minimal riparian cover for rearing salmonids. The dredge tailings were located adjacent to both sides of the stream in the lowest section of the reach. Remediation will require tapering the banks, stabilization with gebtextile fabric, seeding and revegetation. A poorly rip-rapped road adjacent to the stream probably contributes large amounts of sediment into the reach. The road should be moved further from the stream and rip-rapped at a shallower angle with large materials. Other sources of sedimentation which should be corrected include: high sloughing stream banks of unnatural origin, remedied by tapering and revegetating the banks; road and culvert washouts, remedied by rip-rapping and installing adequate culverts; tributary stream blowouts remedied by tapering and/or revegetation. A problem not related to sedimentation is low flows during August and September near the mouth of the stream. These low flows are probably the result of the stream flowing through unconsolidated dredge tailings. Remediation of this potential adult passage barrier requires removal of unconsolidated materials in the stream channel and adjacent dredge tailings.

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BEAR VALLEY CREEK, IDAHO

FISH HABlTAT ENHANCEMENT PROJECT

SELECTED ALTERNATWE REPORT

Prepared for

THE SHOSHONE-BANNOCK TRIBES

This project is funded by the Bonneville Power Administration
under Contract Number 83-359

APRIL, 1985

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April 26, 1985

Shoshone-Bannock Tribes
P. O. Box 306
Fort Hall, ID 83203

Attention: Dr. Richard C. Konopacky, Project Manager

Subject: Bonneville Power Administration Contract No. 83-359
Bear Valley Creek Fish Habitat Enhancement Project

Gentlemen:

We are pleased to submit ten copies of the Selected Alternative Report for the Bear Valley Creek Fish Habitat Enhancement Project. This report covers our obligations for Phases I and III as defined in the scope of services of our November 15, 1984 contract. At your instruction, we also have mailed copies of this report directly to Bear Valley Minerals, Inc. and Bonneville Power Administration. Additional copies of the report are being produced and will be sent to members of the Interagency Task Force on the attached mailing list as soon as possible.

James M. Montgomery, Consulting Engineers, Inc. (JMM) wishes to express its appreciation for providing constructive review, technical input, and information provided by Dr. Konopacky and Mr. Bowles of the Shoshone-Bannock Tribes. The JMM project team also wishes to express their gratitude for the patient assistance of the USDA-Forest Service, Idaho Department of Fish and Game, and Bear Valley Minerals, Inc. and their representative Mr. Richard Porter.

This report presents a description, analysis, and evaluation of the alternative selected by the Shoshone-Bannock Tribes and the Interagency Task Force at their meeting held in Boise on April 2, 1985. It includes chapters discussing implementation and construction considerations, and also presents a livestock access plan. The selected alternative is a refinement of the recommended alternative from the Draft Feasibility Report submitted to the Shoshone-Bannock Tribes on March 26, 1985.

This report is the final submittal for the Feasibility Study portion of the Bear Valley Creek Fish Habitat Enhancement Project. However, information contained in this report may be subject to modification based on further investigation and verification of field conditions. All comments on this report should be directed to Dr. Konopacky.

Again, we appreciate all of the assistance and cooperation provided to JMIM in conducting this study. We look forward to working with the Shoshone-Bannock Tribes, Bonneville Power Administration, the agencies represented on the Inter-agency Task Force, and Bear Valley Minerals, Inc. in successful implementation of this important project in Bear Valley Creek. If you have any questions or comments, please call us at (208) 345-5865.

Very truly yours,

Edwin T. Cryer
Project Manager

Brian D. Liming
Project Engineer/Scientist

Attachment

Enclosures

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USDA-Forest Service, Boise National Forest
USDA-Intermountain Forest and Range Experience Station
USDI-Fish and Wildlife Service
USDI-Bureau of Land Management
Idaho Department of Fish and Game
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CHAPTER 1

SUMMARY

The Selected Alternative Report provides a detailed description and analysis of the alternative selected for protecting, mitigating and enhancing fish habitat in the Bear Valley Creek study area. Chapter 2 presents an introduction to the report and includes a statement of the problem, purpose and background, the scope of study for the project, report utilization, and authorization. The selected alternative is described in Chapter 3, and is comprised of six components which involve stabilization and revegetation of three stream reaches and two adjacent areas. The implementation considerations for the project are discussed in Chapter 4, and they include land ownership, potential conflicts with existing and future use of the patented land, and the permit requirements and acquisition. There are a total of ten permits, approvals, or actions required for implementation of the selected alternative. Chapter 5 provides a discussion on construction considerations including estimated construction quantities, preliminary cost estimates, phasing of construction, and construction scheduling. The cost estimate prepared for the selected alternative is considered a feasibility level estimate with an accuracy of plus 50 percent and minus 30 percent. The total preliminary estimated cost for the selected alternative is approximately 52,500,OOO (April 1985 dollars), and construction will be phased over several years. Chapter 6 ***presents*** the livestock access plan which describes and evaluates four alternative types of fencing, livestock crossings, and the effects of the selected alternative on the existing livestock operations.

CHAPTER 2

INTRODUCTION

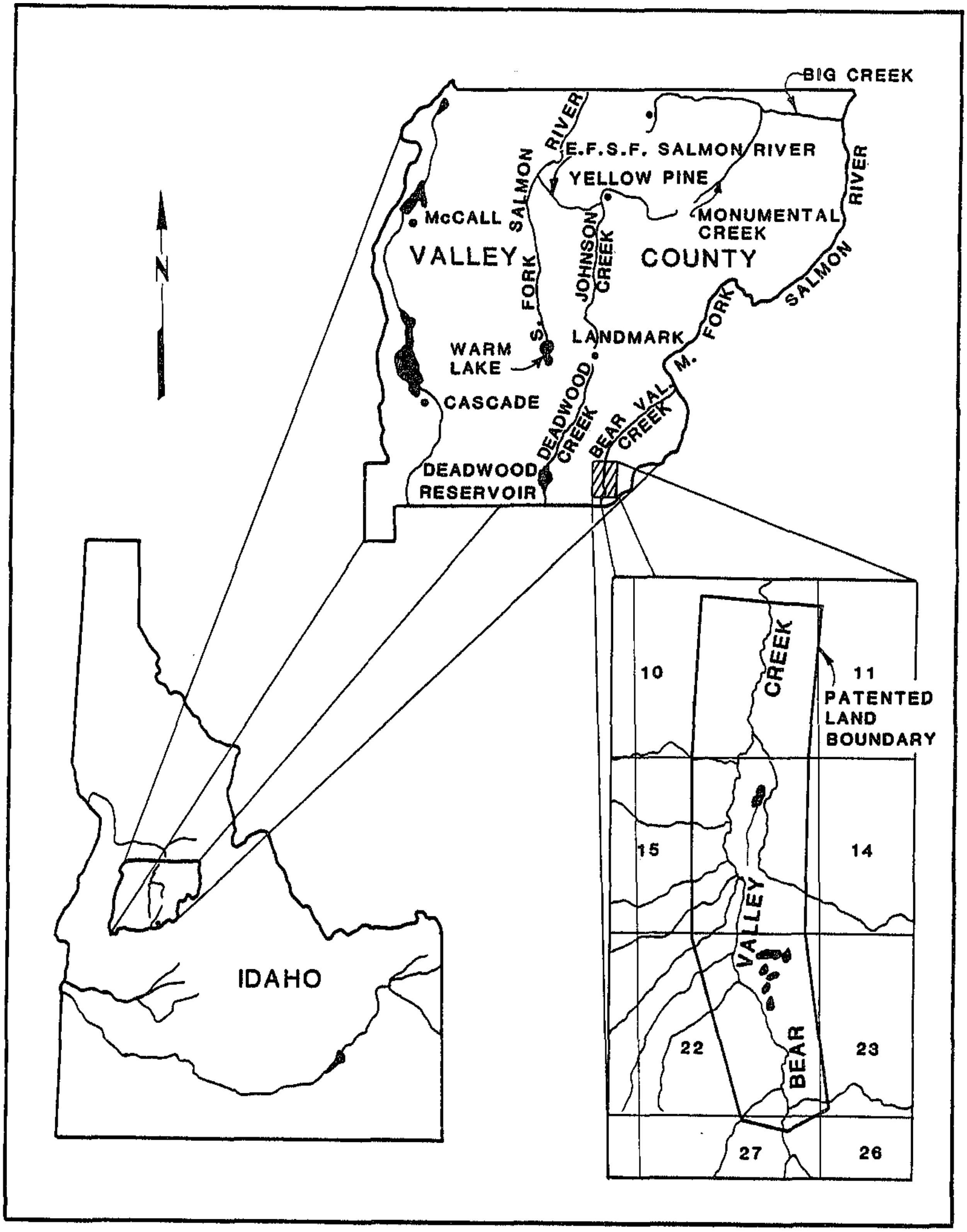
STATEMENT OF PROBLEM

The past thirty years have shown a significant decline in the return of chinook salmon and steelhead to their natural spawning areas in Idaho. There are several significant reasons for the loss of this important resource, including the ***dams on*** the lower Columbia and Snake and Clearwater Rivers, increased fishing pressures by commerical, sport and subsistence fishermen, reduced flows during critical migration periods, water quality problems, and the continuing destruction of spawning and rearing habitat by natural and human accelerated modification of stream channels and bed substratum. Numerous studies and reports have attempted to quantitatively and qualitatively assess the impacts of the various reported reasons for the observed decline in natural anadromous fish spawning. This document is Iimited to one specific aspect of the overall problem. The problem addressed by this report is the stabilization and rehabilitation of one area of sediment production, believed to be affecting extended areas of downstream spawning and rearing habitat. This problem area is the privately held, previously mined lands in the Big Meadows area of the Bear Valley Creek drainage (Figure 2-l). The project study area includes portions of Sections 10, 15, and 22, Township 11 North, Range 8 East, Boise Meridian. It has been estimated that during the past 11 years, at least 11,000 cubic yards of fine, decomposed granitic material has been eroded From approximately two miles of stream bank and areas adjacent to the stream within the study area. Bear Valley Creek was diverted into its present stream channel through the mined area in 1969 and an estimated 500,000 cubic yards of material have been eroded and transported downstream. This material has subsequently been redeposited in the downstream headwaters of the Middle Fork of the Salmon River, which includes a significant portion of the historical spawning areas on the Salmon River drainage. Areas of Bear Valley Creek have historically provided very important chinook salmon spawning ***and*** rearing habitat. Chinook salmon redd counts in Bear Valley Creek prior to the 1950's ranged from an estimated 600 to 1200 during each year. The 1984 chinook salmon redd counts were estimated at 60 for Bear Valley Creek (Konopacky, personal communication, 1985). The decrease of chinook salmon redds in Bear Valley Creek over time demonstrates the need for preserving the diversity of the gene pool of these wild fish.

The Draft Bear Valley Creek, Idaho, Fish Habitat Enhancement Project Feasibility Report (JMM, 1985) identified the problem erosion ***and*** sedimentation areas, and provided an analysis and evaluation of alternatives for eliminating or ameliorating the problems within the patented land of the Bear Valley Creek drainage. This report provides a description and analysis of the alternative selected for implementation ***on*** the ***patented land.***

PURPOSE AND BACKGROUND

The purpose of this report is to provide the Shoshone-Bannock Tribes (Tribes) with a detailed description of the selected alternative that will permit construc-



BEAR VALLEY CREEK
FISH HABITAT ENHANCEMENT PROJECT
LOCATION MAP

FIGURE 2-1

tion of enhancement and mitigation measures in order to protect existing spawning and rearing habitat areas presently undergoing degradation. The Bear Valley Creek Habitat Restoration project has been undertaken in conjunction with other concurrent studies and those yet to be performed, that fall under the Salmon River Habitat Enhancement Program funded by the Bonneville Power Administration (BP.4). This program provides offsite enhancement as partial compensation for fish habitat damage and migration problems related to hydro-electric power projects in the Columbia River Basin. These other studies will evaluate the feasibility of making improvements on the public lands in Bear Valley Creek in order to protect downstream habitat and provide mitigation measures for the area in question. The project is listed in program measure 704.(d)(l), Table 2 of the Northwest Power Planning Council's 1984 Columbia River Basin Fish and Wildlife Program.

The Tribes are sponsoring this project because the Middle Fork of the Salmon River drainage is part of their traditional subsistence fishing ground, as provided in the Treaty with the Eastern Band Shoshoni and Bannock, 1868 and its amendments. The Tribes have invested significant manpower and resources into various studies and management programs for the protection and enhancement of anadromous fish in the Salmon River drainage. The Bear Valley Creek Fish Habitat Enhancement Project is one of the primary habitat protection efforts undertaken by the Tribes.

During the period from 1954 to 1959 the presently patented (privately owned) land (Figure 2-l) in Big Meadows of the Bear Valley Creek drainage was dredge mined for the strategic minerals columbite and euxenite. The past mining operation incorporated reclamation methods appropriate to the technology of the times, however, the site has increasingly become a chronic problem area as a result of these earlier activities. During the past 25 years, the stream has eroded the dredge tailing and undisturbed placer material vertically and horizontally, resulting in the generation of substantial quantities of sediment which subsequently were transported to downstream reaches. The sedimentation has contributed to a reduction of spawning and other critical habitat areas for chinook salmon. The overall purpose of the project, as described in the Project Work Plan (JMM, 1984), is for the Bear Valley Creek Habitat Restoration Program to develop and implement alternatives which will reduce the erosion and sedimentation and enhance the fish habitat.

SCOPE OF STUDY

This report presents a detailed description and analysis of the selected alternative for the patented land in Bear Valley. The selected alternative was described in the Draft Feasibility Report (JMM, 1985) as one of four project alternatives formulated to meet the objectives of the project. The Draft Feasibility Report was written and developed from a technical approach presented in the Project Work Plan (JMM, 1984). Brief discussions of the Project Work Plan and Draft Feasibility Report are included below.

Project Work Plan

The Project Work Plan (JMM, 1984) was prepared in part as a guide for 1) documenting the erosion and sedimentation problems in the study area; and 2) evaluating alternatives necessary to control the problems and improve fish habitat conditions. JMM identified a number of tasks for the feasibility study in the Technical Approach section of the Project Work Plan. The results of the initial tasks were presented to the Shoshone-Bannock Tribes and the Interagency Task Force in a series of ten separate technical memoranda. The technical memoranda were used to prepare portions of the Draft Feasibility Report (JMM, 19851, which was the primary output of the last work task in the Project Work Plan. Copies of the Project Work Plan were submitted to the Shoshone-Bannock Tribes and members of the Interagency Task Force for comment in November 1984.

Draft Feasibility Report

The Draft Feasibility Report (JMM, 19851 was prepared to document 1) the results of a data and literature search, 2) the data analysis of physical characteristics and erosion problems in the study area, 3) the procedure used to formulate and develop alternative components, and 4) the analysis and evaluation of project alternatives using engineering and environmental criteria. The Draft Feasibility Report identified a recommended alternative for implementation within the patented land in Bear Valley. A refinement of the recommended alternative is presented as the selected alternative in this report.

Data and Literature Search. The data and literature search resulted in a compilation of information about past studies in Bear Valley and related analogous studies in similar areas. The information and data collected on Bear Valley was primarily qualitative, but sufficient to complete the feasibility study within the stated assumptions. The literature compiled for the project includes reports, articles, and other information on similar projects which was used in the development of alternatives. Some of the literature on stream habitat enhancement, riparian revegetation, and bank restoration is referenced in this report.

Characterization of the Study Area and Problem Identification. The physical characteristics and erosion problems of the study area were analyzed using the data and information collected on Bear Valley. Surface water hydrology was analyzed using a computer model to estimate a design event streamflow. The 1974 snowmelt runoff was determined to be an appropriate design event, yielding an estimated peak flow of 616 cfs from the study area and its tributary watershed. Groundwater flows of 20 to 30 cfs were estimated from the limited stream gauging data. The plants in the study area were characterized in terms of four vegetation types. Erosion and sedimentation rates were estimated from USDA-Forest Service (USFS) cross section data. Soils were described in terms of three main landtype associations recognized by the USFS. Geology and mineral resources were characterized from various government agency reports and information provided by Bear Valley Minerals, Inc. Upon completion of these and other data analyses, the study area was systematically divided into stream reaches and adjacent areas according to severity of erosion and associated problems using a set of evaluation criteria. The problem stream reaches and adjacent areas were then ranked and assigned a priority for development of preliminary alternatives.

Preliminary Alternative Development. The preliminary alternatives were formulated and analyzed using a procedure incorporating the objectives of the project. Alternative components developed for the study area ranged from diversion of the stream around the mined area to stabilization of the stream channel in its existing alignment. The alternative components were then screened based on relative construction cost, engineering feasibility and constructability, implementation requirements, reliability, and effectiveness. The screening procedure resulted in identification of four project alternatives which would each provide an overall solution to the identified problems within the study area. The "no action alternative" was briefly discussed and not considered further because it would not meet the project objectives.

Analysis and Evaluation of Project Alternatives. The project alternatives were described by component and then evaluated using engineering and environmental criteria. These criteria included:

- Engineering Feasibility and Constructability
- Reliability and Effectiveness
- Implementation Considerations
- Environmental Effects
- Preliminary Cost Estimates

The project alternatives, including the recommended alternative, are briefly described below.

Project Alternative I. Project Alternative I would involve constructing a 15,600 foot diversion channel throughout the length of the patented land in Sear Valley. The objectives of this alternative are to divert Bear Valley Creek around all of the problem stream reaches through a stabilized channel with constructed floodplain and revegetate two problem adjacent areas. There are four primary components comprising Project Alternative I including the main diversion channel, a vest side drainage channel, and stabilization of the two problem adjacent areas. The total preliminary cost estimate of Project Alternative I is approximately $18.6 million (March 1985 dollars).

Project Alternative IL Project Alternative LI involves constructing a 9,200 foot diversion channel through a portion of the patented land in Bear Valley. The objectives of this alternative are to divert Bear Valley Creek around three problem stream reaches through a stabilized channel with constructed floodplain, stabilize/revegetate two problem stream reaches, and stabilize/revegetate two problem adjacent areas. There are six primary components comprising Project Alternative II including the main diversion channel, a west side drainage channel, and stabilizing the two problem stream reaches and two problem adjacent areas. The total preliminary cost estimate of Project Alternative II is approximately $11.9 million (March 1985 dollars).

Project Alternative III. Project Alternative III would involve constructing a 12,800 foot diversion channel through a portion of the patented land in Bear Valley. The objectives of this alternative are to divert Bear Valley Creek around five problem stream reaches through a stabilized channel with constructed flood-plain, and stabilize/revegetate two problem adjacent areas. There are four primary components comprising Project Alternative Ll including the main diversion channel, a west side drainage channel, and stabilization of the two problem adjacent areas. The total preliminary cost estimate of Project Alternative IU is approximately $14.8 million (March 1985 dollars).

Project Alternative Iv. Project Alternative IV would involve constructing a 2,200 foot diversion channel around one problem stream reach and stabilizing the existing Bear Valley Creek channel through other selected areas of the patented land. The objectives of this alternative are to divert Bear Valley Creek around one problem stream reach, stabilize/revegetate four problem stream reaches in the existing channel, and stabilize/revegetate two problem adjacent areas. There are seven primary components comprising Project Alternative lV. The total preliminary cost estimate of Project Alternative IV is approximately $3.8 million (March 1985 dollars).

The project alternatives were evaluated in terms of the criteria listed earlier and rated using a point system. The ratings are shown in Table 2-1, and Project Alternative lV is rated the highest through this evaluation process. Project Alternative IV is the recommended alternative, and is refined and described in the remaining chapters of this report as the selected alternative. A complete description of the procedure used in development, analysis, and evaluation of the alternatives as discussed above may be found in the Draft Feasibility Report (JMM, 1985).

REPORT UTILIZATON

This report considers the preliminary feasibility of controlling and reducing erosion and sedimentation arising from the patented land in the Bear Valley Creek drainage with an overall objective to enhance fish habitat. Although care has been taken to assure the reliability of the information set forth in this report, the site specific research has not been as exhaustive as originally proposed, due to the inability to conduct additional field studies in 1984 because of the onset of winter. Data and factual information obtained from third parties have not been independently verified. The timing of the study has not permitted any assessment of the reliability of data obtained during the course of the study ***or*** at other specific times. Therefore, for these and other reasons, the possibility of error or misinterpretation of information supplied by third parties cannot be entirely ruled out, though care has been taken to assure the greatest reliability possible under the circumstances. Nevertheless, all findings, conclusions, data, and information expressed in this report should be regarded as preliminary and subject to further refinement and development, when the design of the selected modifications is actually undertaken.

As currently envisioned, additional field verification will be conducted in spring 1985 with all necessary design support studies finalized by July/August 1985.

TABLE 2-1

SUMMARY RATING OF THE PROJECT ALTERNATIVES

Project Alternative	Engineering Feasibility and Constructability (l-5)	Reliability and Effectiveness (f-51	Implementation Considerations (1-5)	Environmental Effects (1-5)	Preliminary cost Estimates (1-5)	Total Point Rating (5-25)
I	1	2	3	3	1	10
II	2	2	3	3	2	12
III	2	2	3	3	1	11
Iv	4	5	3	5	4	21

Initial design of the selected improvements will be completed during the calendar year 1985. Construction of the selected project components will be phased over several summer and fall construction seasons. Final estimated cost, implementation plans, permitting activities and construction management activities will be addressed during the design phase.

AUTHORIZATION

The Bear Valley Creek, Idaho, Fish Habitat Enhancement Project is being performed by James M. Montgomery, Consulting Engineers, Inc. (JMM) for the Shoshone-Bannock Tribes, under Bonneville Power Administration fBPA) contract number 83-359. The project is funded by BPA's Division of Fish and Wildlife as part of the overall effort to protect, mitigate, and enhance fish habitat and resources impacted by hydroelectric development and operation in the Columbia River Basin. Bear Valley Minerals, Inc., owner of the area under study, has granted an easement to the Tribes for conducting the feasibility study on the patented land in Bear Valley.

ABBREVIATIONS

In order to conserve space and improve readability, the following abbreviations have been used throughout this report:

BLM..........	Bureau of land Management
BPA..........	Bonneville Power Administration
cfs............	cubic feet per second
COE.:.........	U.S. Army Corps of Engineers
cu yd..........	cubic yard
cu yd/yr.	cubic yard per year
cu ft.	cubic feet
USFS..........	USDA-Forest Service
ft.	foot (feet)
fps............	feet per second
USFWS.......	USDI-Fish and Wildlife Service
HEC..........	Hydrologic Engineering Center
IDFG.	Idaho Department of Fish and Game
IDWR.........	Idaho Department of Water Resources
JMM...........	James M. Montgomery, Consulting Engineers, Inc.
lin ft..........	linear foot (feet)
sq mi.	square mile(s)
mg/l..................	milligram (5) per li ter
min............	millimeter
MSL.	mean sea level
scs............	USDA - Soil Conservation Service
sq ft...........	square feet
sq yd..........	square yard
tons/sq mi/yr	tons per square mile per year
tons/yr.......	tons per year
Tribes.........	The Shoshone-Bannock Tribes
USGS..........	USDI - Geological Survey
yr	years

CHAPTER 3

DESCRIPTION OF THE SELECTED ALTERNATIVE

INTRODUCTION

This chapter provides a detailed description of the Bear Valley Creek Fish Habitat Enhancement Project selected alternative by its individual components. Each component corresponds to an identified problem stream reach or adjacent area on the patented land, as presented in the Draft Feasibility Report (JMM, 1985). The selected alternative is comprised of six components, including stabilization and revegetation of three stream reaches and two adjacent areas, and minor components. The minor components consist of revegetating small, isolated disturbed areas and fencing around enhancement areas on the patented land.

Two additional stream reaches were identified as part of the recommended alternative in the Draft Feasibility Report (JMM, 1985). Stream reaches B and I will be given further consideration when site access is possible, but are not discussed in detail in this report. These two problem stream reaches will receive further study during the 1985 field season to determine the extent of the problems and the need for stabilization and revegetation. Recommendations for stream reaches B and I will be made in a technical memorandum to be prepared following a late June 1985 field session in Bear Valley with the Interagency Task Force.

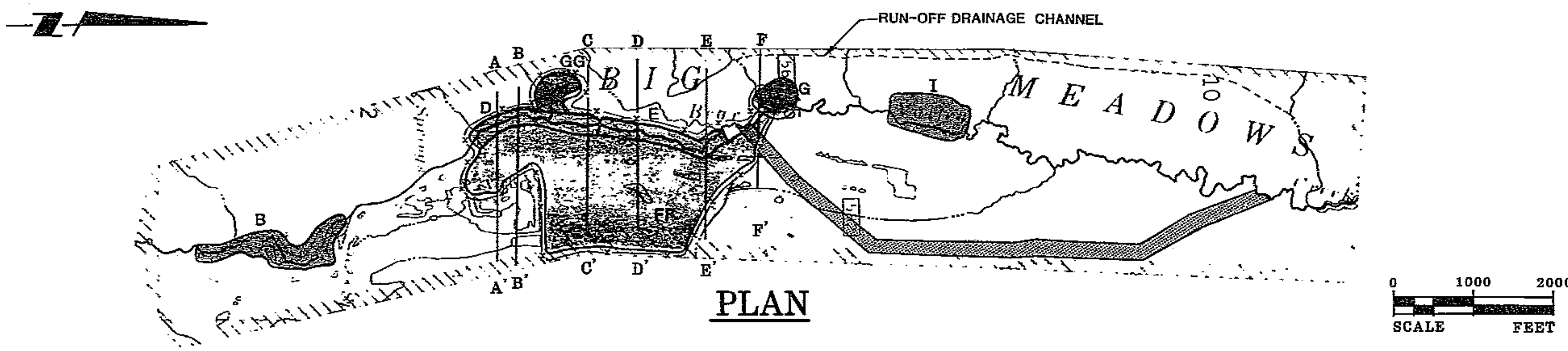
A summary analysis of the selected alternative is presented at the end of this chapter and includes an explanation of the recommended construction treatments and a brief discussion of the project objectives in terms of the selected alternative. It is important to remember that the overall goal of the selected alternative is to enhance fish habitat in Bear Valley Creek.

DESCRIPTION OF THE SELECTED ALTERNATIVE COMPONENTS

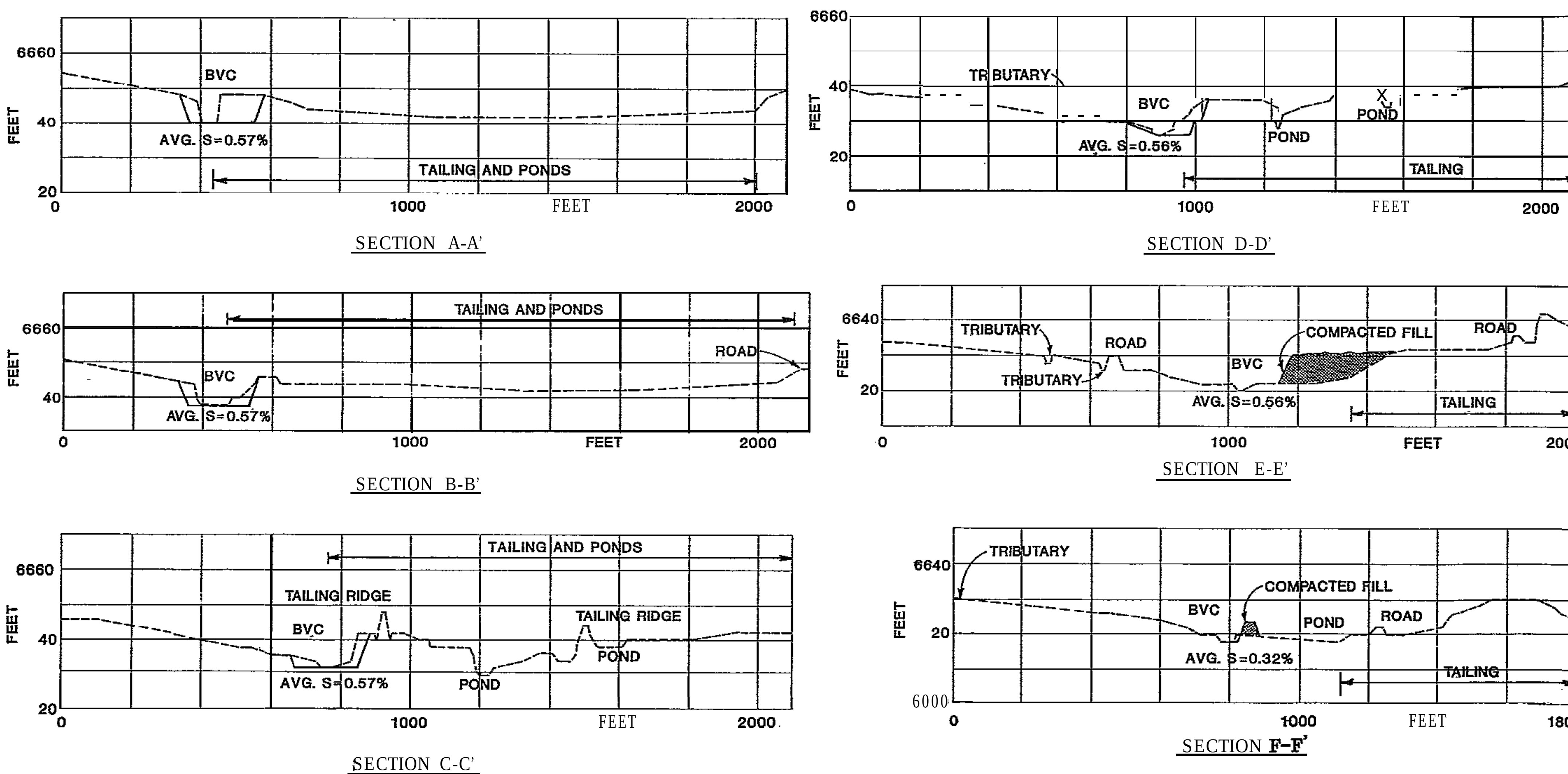
The selected alternative components are described below in terms of location, proposed modifications, design streamflow, stream velocity, stream channel width, constructed floodplain features, riparian vegetation and stabilization, and other characteristics, as applicable. The discussion is focused on the stabilization and revegetation of stream reaches D, E, and G, revegetation of adjacent areas GG and FF, and minor components, as shown in Figure 3-l. Schematic drawings of the enhancement measures are included to help describe the selected alternative components.

Stabilization and Revegetation of Stream Reach D

The stabilization and revegetation of stream reach D will be located as shown on Figure 3-1. The primary objectives of this component of the selected alternative are to stabilize and revegetate both stream banks and the floodplain of stream reach D. The improvements will be made over a total distance of approximately



PLAN



SECTIONS

BEAR VALLEY CREEK FISH HABITAT ENHANCEMENT PROJECT

FIGURE 3-1

PREFERRED ALTERNATIVE, ENHANCEMENT PROJECT

LEGEND

PLAN

PATENTED LAND BOUNDARY

D STABILIZATION AND REVEGETATION OF STREAM REACHES

GG STABILIZATION AND REVEGETATION OF ADJACENT AREAS

I STREAM REACHES TO RECEIVE FURTHER STUDY IN THE FIELD

E–E' CROSS SECTION LOCATIONS

PROPOSED FENCING

PROPOSED STREAM CHANNEL REALIGNMENT

SECTIONS

PROPOSED CONSTRUCTED FLOODPLAIN

EXISTING CROSS SECTIONS

AVG. S AVERAGE SLOPE

BVC BEAR VALLEY CREEK

COMPACTED FILL

NOTE: ALL CHANNEL SIDE SLOPES ARE 3:1. CROSS SECTION SCALE IS 10 TO 1 VERTICAL EXAGGERATION.

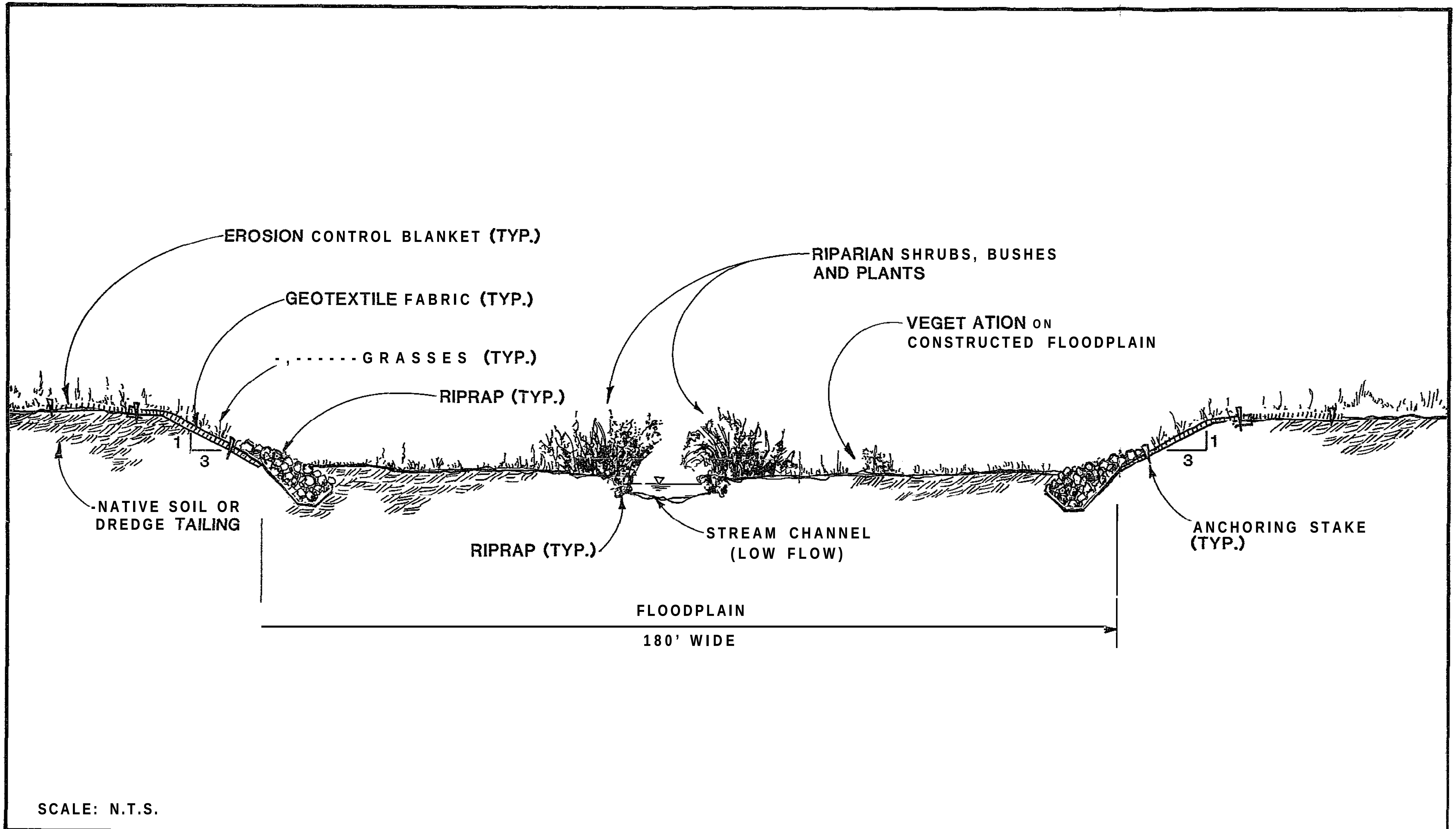
JAMES M. MONTGOMERY,
CONSULTING ENGINEERS, INC.

1500 feet. A schematic section typical of the improvements is shown in Figure 3-2.

The existing nearly vertical banks along the stream will be excavated back to provide a floodplain for stream meandering and snowmelt runoff flood flows. Cross sections of the constructed floodplain are shown in Figure 3-l. The floodplain will be constructed to provide capacity for the estimated design peak runoff of approximateIy 250 cfs. The floodplain will be 180 feet wide as determined by the approximate width of the stream meander belt in Big Meadows prior to the mining activity. The proposed floodplain width is subject to modification during design of the improvements which will include analysis of the backwater curve using the HEC-2 computer model. The design peak flow would have an average depth of approximately 0.8 feet in the constructed floodplain and a velocity ranging from 1.7 to 2.0 fps. The constructed floodplain is schematically shown in Figure 3-2.

The banks defining the limits of the constructed floodplain will be sloped 3 to 1 and stabilized with a combination of specialized geotextile fabric, erosion control blanket, vegetation, and riprap. The geotextile fabric under consideration has designed openings that provide for vegetative growth. The erosion control blanket is a natural wood fiber mat which helps promote ***vegetative*** growth by retaining soil moisture, controlling soil surface temperature fluctuations, and stabilizing disturbed soil surfaces. The side slopes will first be broadcast seeded with an appropriate mixture of grass seeds to encourage revegetation. Soil nutrient requirements and fertilization rates will be determined following completion of field studies. The erosion control blanket will be installed over the seeded slopes. The geotextile fabric will then be installed over the lower portion of the erosion control mat as shown in Figure 3-2. The riprap will be placed on top of the geotextile fabric at the toe of the side slopes and keyed into the constructed floodplain to a depth of at least two feet below the invert of the stream channel. This will help prevent the stream from continuing a meander into the stabilized floodplain bank. The riprap will have an average diameter of 10 inches and a maximum diameter of 15 inches. The riprap will extend up the slope to a height of one foot above the design peak flow water ***surface- The*** overall stabilization of the floodplain banks will be applied to both sides of the, floodplain, as shown in Figure 3-2.

The existing low flow stream channel will be left undisturbed in its present alignment. The stream channel banks will be stabilized with riprap and re-, vegetated with riparian plants to promote establishment of root mats and small overhangs which provide cover habitat for fish. The riprap will be placed along the stream where necessary to help build and stabilize banks. Riparisn shrubs, bushes, and other plants or cuttings will be planted along the banks in the wet zone as discussed by Claire and Scherzinger (1978), and Claire (1980). The constructed floodplain will be planted with shrubs and grasses adapted to growing in capillary zone conditions (Claire and Scherainger, 1978). Erosion control blankets will be used in some portions of the constructed floodplain to help promote the revegetation effort. Soil nutrient requirements and fertilizer application rates will be determined following completion of field studies. The establishment of vegetation in the constructed floodplain will help stabilize the



SCHEMATIC SECTION OF STREAMBANK STABILIZATION AND CONSTRUCTED FLOODPLAIN IN REACH D

FIGURE 3-2

soil surface and return the floodplain to conditions like those in downstream areas generally undisturbed by the past mining activity. The streambank and floodplain stabilization and revegetation for reach D are schematically shown in Figure 3-2.

The stabilization and revegetation of reach D will require considerable excavation and construction activity. The floodplain construction will generate an estimated 44,000 cubic yards of excess fill material, which will be used to fill a portion of reach F (Figure 3-l) and selected sites within adjacent area FF. A schematic plan of the stabilization and revegetation of reach D is shown in Figure 3-3. A complete balanced cut and fill plan will be prepared as part of the design phase of this project.

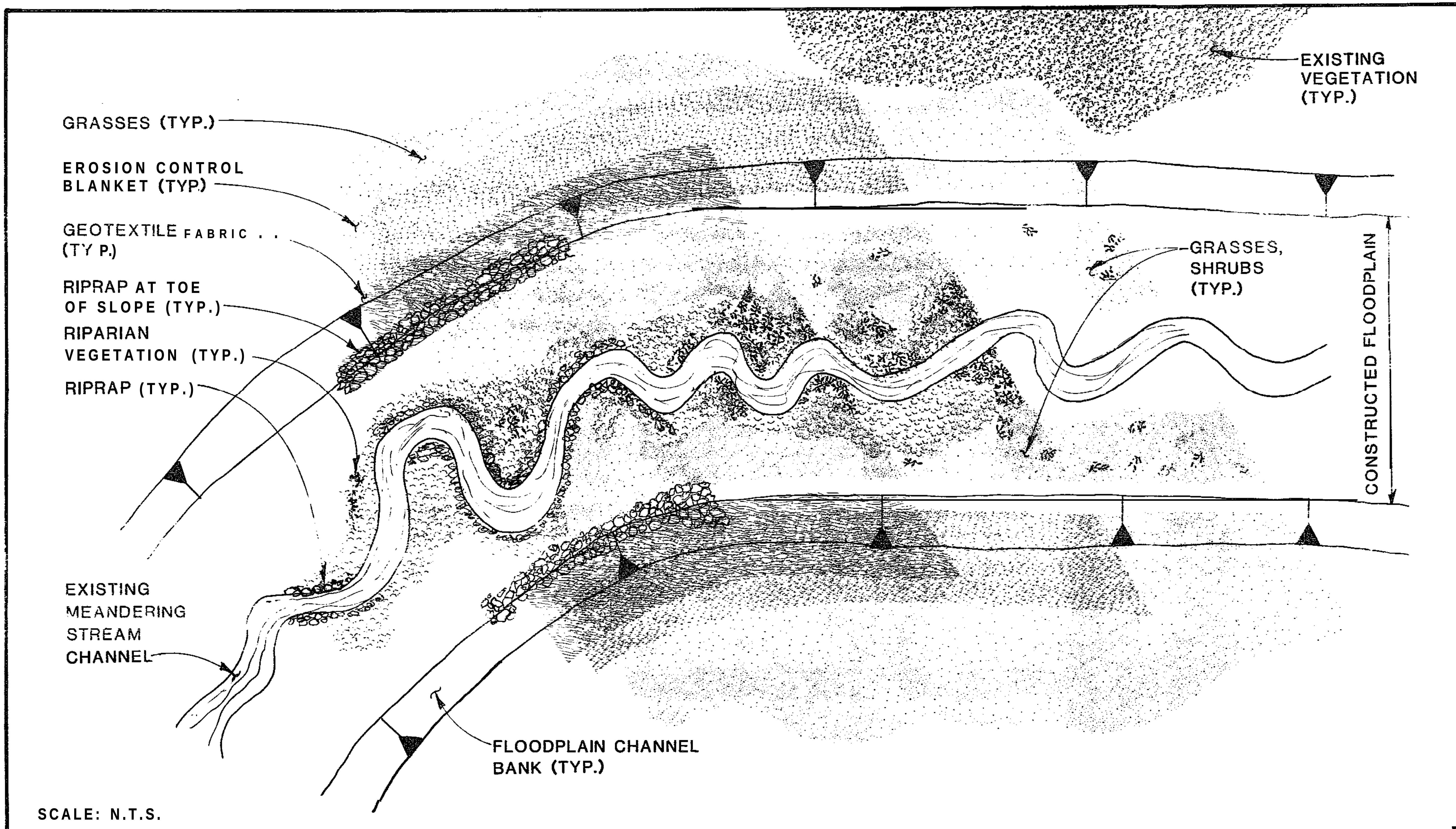
Stabilization and Revegetation of Stream Reach E

The stabilization and revegetation of stream reach E will be located as shown on Figure 3-1. The primary objectives of this component of the selected alternative are to stabilize the east streambank through construction of a floodplain and revegetate both streambanks in reach E. The improvements will be made over a total distance of approximately 1900 feet, including 200 feet of reach F. The stabilization of stream reach E will be similar to the description provided for stream reach D, however, only the east hank will be excavated to provide a constructed floodplain. A schematic section typical of the improvements is shown in Figure 3-4.

The existing nearly vertical east bank along the stream will be excavated back to increase the floodplain for stream meandering and snowmelt runoff flood flows. Cross sections of the constructed floodplain are shown in Figure 3-l. The floodplain will be constructed to provide capacity for the estimated design peak runoff flow of approximately 270 cfs. The floodplain will be 180 feet wide as determined by the approximate width of the stream meander belt in Big Meadows prior to the mining activity. The proposed floodplain width may be modified during design of the improvements and after further hydraulic analysis of the backwater curve using the HEC-2 computer model. The design peak flow would have an average depth of approximately 0.85 feet in the constructed floodpIain and a velocity ranging from 1.8 to 2.0 fps. The constructed floodplain section is schematically shown in Figure 3-4.

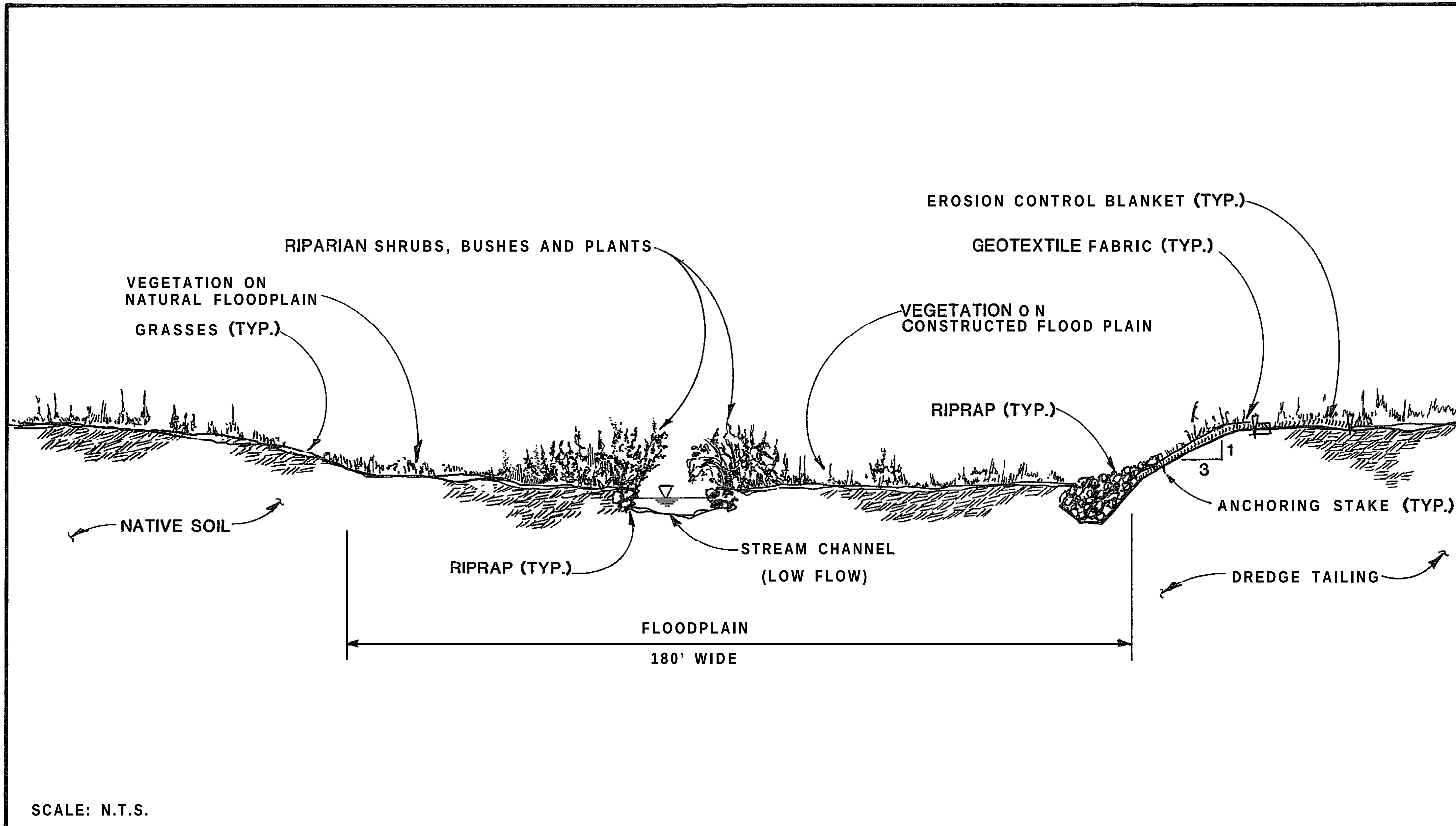
The east bank defining the limits of the constructed floodplain will he sloped 3 to 1 and stabilized with a combination of specialized geotextile fabric, erosion control blanket, vegetation, and riprap, as discussed previously in the section describing improvements to stream reach D. The west bank of the floodplain through reach E will be revegetated with riparian shrubs, bushes, and other plants as necessary. The overall stabilization of the floodplain banks will be applied as shown in Figure 3-4.

The existing stream channel will be left undisturbed in its present alignment. The stream channel banks mill be stabilized with riprap and revegetated with riparian plants to promote encroachment of the vegetation on the stream channel, as described earlier in the discussion of improvements to stream reach D.



SCHEMATIC PLAN OF S I REAMBANK STABILIZATION AND CONSTRUCTED FLOODPLAIN IN REACH D

FIGURE 3-3



SCHEMATIC SECTION OF STREAMBANK STABILIZATION AND CONSTRUCTED FLOODPLAIN IN REACH E

FIGURE 3-4

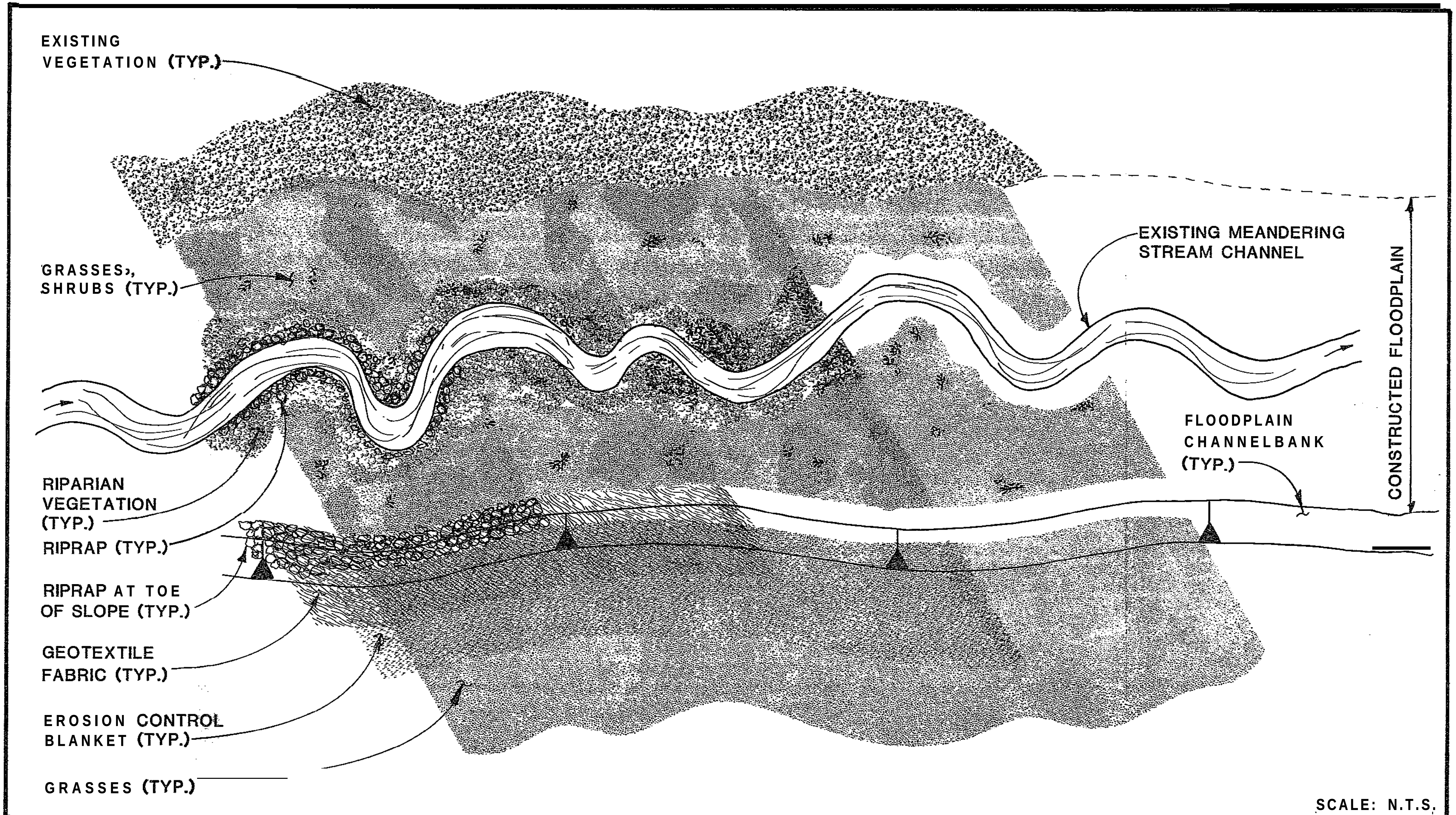
The constructed floodplain in reach E also will be stabilized and revegetated as described earlier for reach D. The streambank and constructed floodplain stabilization and revegetation for reach E are schematically shown in Figure 3-4.

The stabilization and revegetation of reach E will require substantial excavation and construction activity. The floodplain construction in reach E will generate an estimated 30,000 cubic yards of excess fill material. This excess material will be used to fill a portion of reach F (Figure 3-l) and selected sites within adjacent area FF. Approximately 200 feet of floodplain channel side slope stabilization in the filled portion of reach F is included in the 1900 feat of improvements selected for reach E. A schematic of the stabilization and revegetation of reach E is shown in Figure 3-5.

Stabilization and Revegetation of Stream Reach G

The stabilization and revegetation of stream reach G will be located at the bridge crossing in Section 15 as shown on Figure 3-1. The primary objectives of this component of the selected alternative are to stabilize both streambanks above and below the bridge through excavation and revegetation where necessary in reach G. The improvements will be made over a total distance of 600 feet along the stream and include revegetation of approximately one acre adjacent to the stream. The design of these improvements will be initiated following corn-. pletion of field studies to help determine the hydraulic capacity of the bridge and the flood backwater curve. The design will include an analysis of the backwater curve using the HEC-2 computer model to determine if the bridge constricts streamflow or if the area downstream of the bridge is flooding and causing upstream areas to flood. The upstream and downstream channel widths estimated below are subject to modification during design of the improvements. The stabilization and revegetation of the streambanks in reach G will be similar to the description provided for reach D, however, a constructed floodplain will not be incorporated into the improvements because of the bridge width. A schematic section typical of the improvements is shown in Figure 3-6.

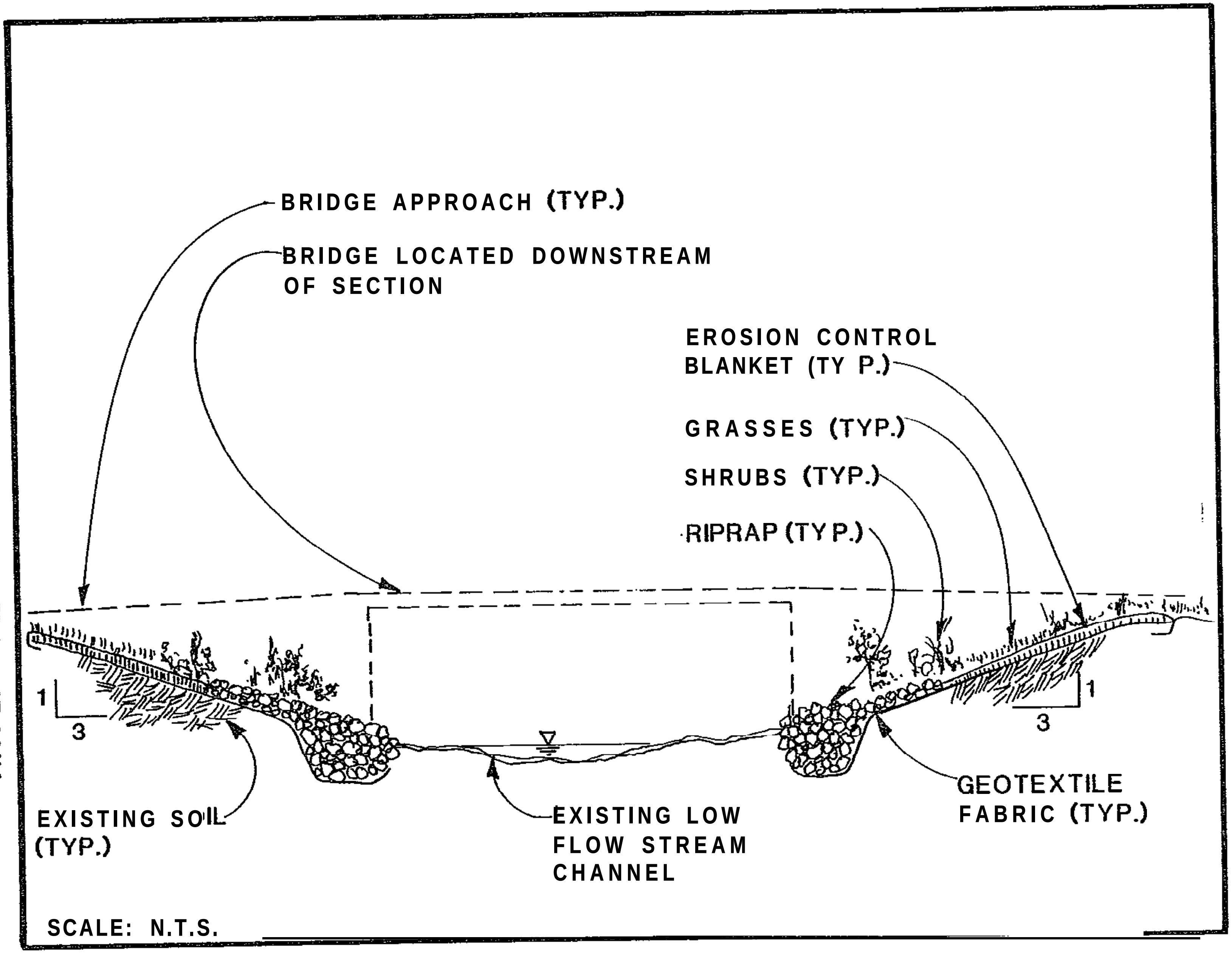
The steep, unstable banks in reach G will be excavated back at a 3 to 1 slope. The existing channel at low flow has a width of approximately 20 feet. The' improvements will include widening the existing channel to 30 feet and provide adequate capacity for the estimated design peak runoff flow of approximately 328 cfs. The design peak flow would have a depths of approximately 3.0 feet and a velocity of 3.0 fps. The freeboard required for this flow depth and velocity would increase the total streambank height to six feet above the invert of the channel. The 3 to 1 side slopes will be stabilized with specialized ` fabric, erosion control blankets, vegetation, and riprap, as discussed earlier in the section describing improvements to stream reach D. The size of riprap used in reach G will have an average diameter of 12 inches and a maximum diameter of 18 inches. The riprap will extend up the side slopes to a height of one foot above the design peak flow water surface. Vegetation used in the bank stabilization efforts will include riparian bushes, shrubs, and other plants selected for the site. The overall stabilization of the streambanks along reach G will be accomplished as shown in Figure 3-6.



SCHEMATIC PLAN OF STREAMBANK
STABILIZATION AND CONSTRUCTED
FLOODPLAIN IN REACH E

FIGURE 3-5

SCHEMATIC SECTION OF STREAMBANK
STABILIZATION AND REVEGETATION
IN REACH G
FIGURE 3-6



The stabilization and revegetation of reach G will require some excavation and other construction activity. The bank excavation will require ***moving*** approximately 6000 cubic yards of earth, and filling and compacting some of the excess material along the banks to provide the necessary freeboard through reach G. The disturbed area adjacent to the stream will be recontoured as necessary, and stabilized using erosion control blankets in combination with broadcast seeding and fertilization. The appropriate seed mixtures, soil nutrient requirements, and fertilization rates will be determined following completion of field studies. A schematic plan of the stabilization and revegetation of reach G is shown in Figure 3-7.

Stabilization and Revegetation of Adjacent Area GG

The stabilization and revegetation of adjacent area GG will be located as shown on Figure 3-1. The primary objectives of this component of the selected alternative are to stabilize and revegetate the disturbed adjacent area GG which will prevent further erosion. The improvements will cover an area of approximately 1.5 acres. A schematic section typical of the stabilization and revegetation for adjacent area GG is shown in Figure 3-8.

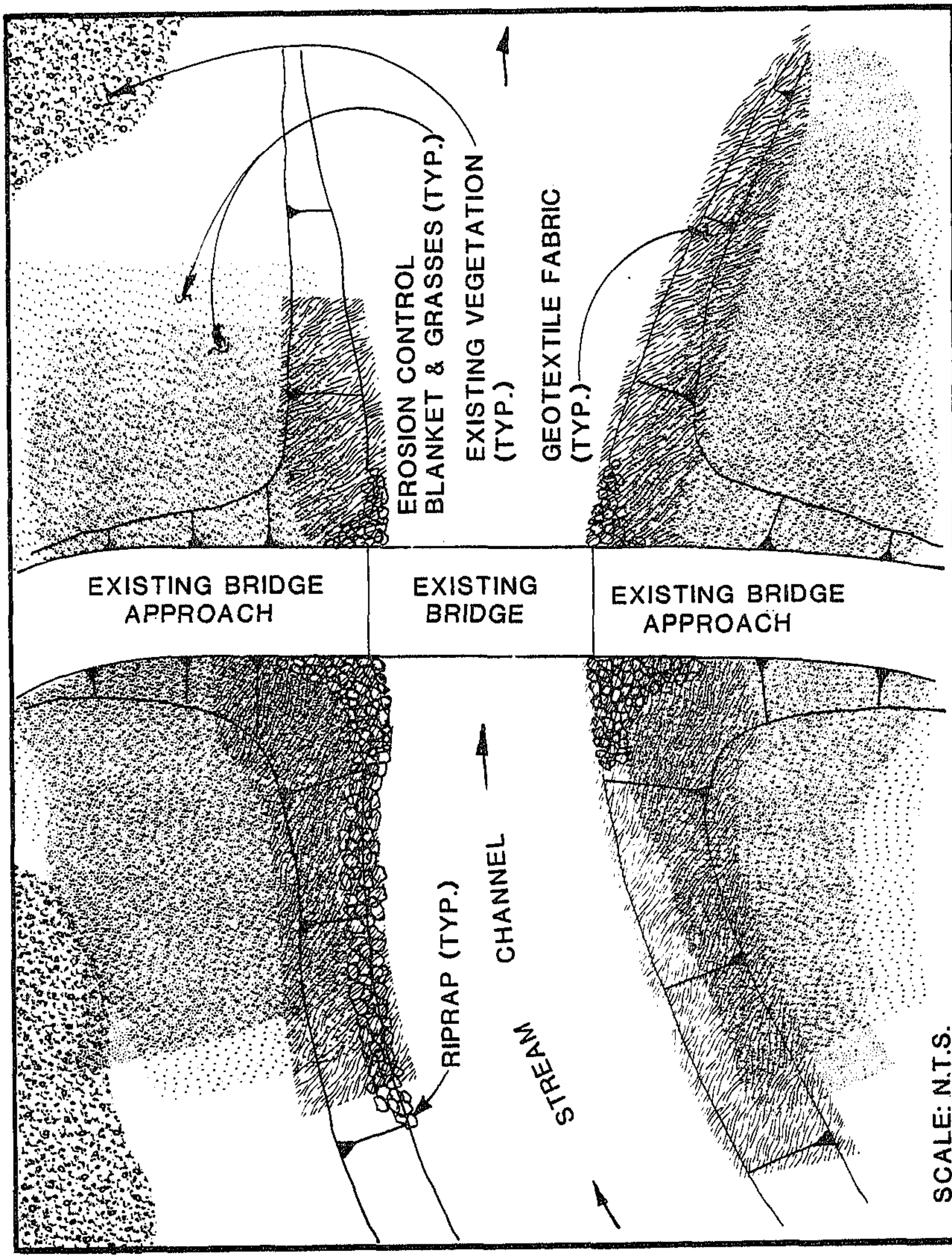
The eroded portions of adjacent area GG will be recontoured and graded to provide small terraces and depressions for collection of runoff and retention of surface water and sediment. These areas will be broadcast seeded and fertilized as appropriate to promote vegetation growth. The most severely distrubed areas will be covered with the erosion control blanket to help minimize erosion and retain moisture for plant growth. Broadcast seeding and fertilization rates for adjacent area GG will be determined after completing field studies to test the effectiveness of various revegetation efforts. Broadcast seeding will be accomplished during the fall seasons just prior to snowfall.

The tributary flowing through adjacent area GG will be stabilized with riprap, the specialized geotextile fabric, erosion control blankets, and vegetation. The riprap will be placed in the tributary channel to stabilize the channel bottom. The banks will be graded back, broadcast seeded, and covered with the erosion control blanket. The geotextile fabric will be installed over the top of the erosion control blanket on the tributary stream channel banks.

Stabilization and Revegeation of Adjacent Area FT

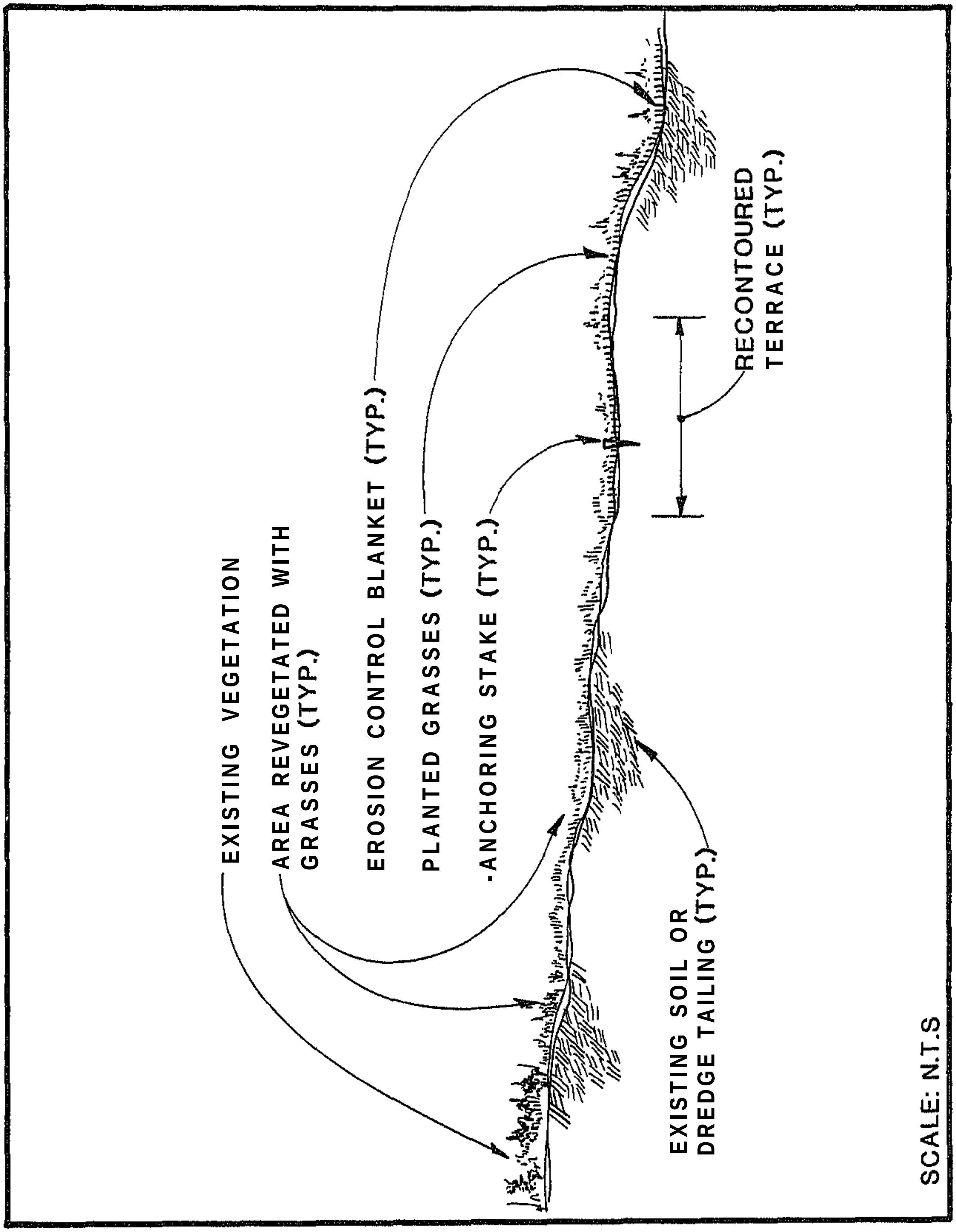
The stabilization and revegetation of adjacent area FF will be located as shown on Figure 3-l. The primary objectives of this component of the selected alternative are to stabilize and revegetate portions of the disturbed adjacent area FF which will prevent further erosion. The improvements will cover an area of approximately 31 acres. A schematic section typical of the stabilization and revegetation for adjacent area FF is shown in Figure 3-8.

Excess material excavated from the stabilization of stream reaches and E will be used to fill portions of adjacent area FF. The filled areas would be compacted and contoured to provide small terraces and depressions for collection of runoff and retention of surface water and sediment. These areas will be broad-



SCHEMATIC PLAN OF STREAMBANK -STABILIZATION AND REVEGETATION IN REACH G

FIGURE 3-7



SCHEMATIC SECTION TYPICAL OF STABILIZATION
AND REVEGETATION FOR ADJACENT AREAS
FIGURE 3-8

cast seeded or hydromulched to promote vegetative growth. Seeding and fertilization rates will be determined following completion of field studies to test the effectiveness of various revegetation efforts. Broadcast seeding would be accomplished during the fall season just prior to snowfall. The severely disturbed areas of adjacent area FF will be broadcast seeded and covered with the erosion control blanket to help promote revegetation.

Tributary streams flowing through adjacent area FF to the main stream channel will be stabilized with small riprap and geotextile fabric as necessary. The tributary channels draining adjacent area FF are active only during and just after the snowmelt runoff season. These channels will be stabilized with a combination of riprap and geotextile fabric, and broadcast seeded to help promote revegetation.

Minor Components

The selected alternative has several minor components including miscellsneous revegetation of other areas, and fencing around the stabilized and revegetated areas of the patented land. The miscellaneous revegetation will be accomplished on severely disturbed lands not within adjacent areas GG and FF. These disturbed areas have a total area of seven acres within the patented lan. A portion of these areas will be stabilized with erosion control blankets and broadcast seeded to promote revegetation. The remaining areas will be hydromulched to help establish new vegetaion. Broadcast seeding, fertilization, and hydromulching application rates will be determined following completion of field studies designed to test the effectiveness of various revegetation strategies.

The stabilized and revegetated areas comprising the selected alternative will be fenced to help protect the improvements from livestock and wildlife. The fencing will primarily serve to exclude range animals from the revegetated and stabilized areas on the patented land, and will not prevent movement of livestock between meadow areas upstream and downstream of the improvements. A more detailed discussion of the types of fences which could be used, their effectiveness and maintenance requirements, and other aspects relating to livestock access, are presented in Chapter 6 of this report.

SUMMARY ANALYSIS OF THE SELECTED ALTERNATIVE

The selected alternative will provide a feasible, reliable, and effective means of stabilizing and revegetating the three stream reaches and two adjacent areas. The components comprising the selected alternative will incorporate several different construction treatments. These treatments are reviewed in the following section. A brief discussion of how the selected alternative accomplishes the project objectives is included at the end of this section.

Recommended Construction Treatments

The recommended construction treatments discussed in the previous section represent typical construction methods and were selected based on the following criteria:

- Engineering Feasibility
- Constructability
- Reliability
- Effectiveness
- Environmental Compatibility
- Estimated Cost

Each treatment approach was thoroughly researched using the literature ***col-*** lacted for the annotated bibliography included with the Draft Feasibility Report (JMM, 1985) and also utilizing manufacturer's and supplier's information. The recommended construction treatments are briefly addressed in Table 3-1. The information provided in Table 3-1 includes a brief description, purpose of use, and sequence of use, for each recommended construction treatment.

Selected Alternative and Project Objectives

The selected alternative is a refinement of Project Alternative IV, as discussed earlier in Chapter 2 and the Draft Feasibility Report (JMM, 1985). This recommended alternative was developed based on objectives identified for the project by the Tribes and the Interagency Task Force. The overall goal of the project is to enhance fish habitat in the Bear Valley Creek drainage. The implementation of the selected alternative would directly enhance fish habitat within specific reaches of the patented land, and also would have a major indirect effect on the fish habitat within public lands downstream of the study area. The project objectives were all formulated with the overall goal of enhancing the available fish habitat within Bear Valley Creek.

The objectives of this project, defined as the potential improvements which could be made within the patented land boundaries, would be accomplished as a result of implementing the components of the selected alternative. The project objectives for the patented land are listed below in descending order of priority.

1. Stabilize steambanks and stream channel, and control or reduce erosion to near natural levels.

2. Reduce deposition and/or downstream transport of sediment.

3 Minimize turbidity, and maintain or improve water quality.

4. Improve aesthetics through revegetation and recontouring of the mined areas.

5. Create or improve chinook salmon spawning and rearing habitat.

The project objectives would each be accomplished to some degree by implementation of the selected alternative. The first objective would be met by stabilizing and revegetating stream reaches D, E, and G. Reaches B and I will receive further study in the field to determine the need for stabilization and potential alternatives. The second objective would be partially accomplished if the first objective is met by successful implementation of stabilization and re-

TABLE 3-I

DESCRIPTION OF RECOMMENDED CONSTRTJCTION TREATMENTS
BEAR VALLEY CREEK PROJECT STUDY AREA

Treatments	Description	Purpose of Use	Sequence of Use
Riprap	Stone 10" to 18" diameter; placed along toe of streambank slope at depth of 2 feet below invert of stream channel	Anchors geotextile fabric at toe of streambank; armors streambank to prevent erosion	Used after- 'installation of geotextile fabric; placed over top of geotextile fabric; may be placed along streambanks
Geotextile Fabric	Woven, three dimensional matting made of heavy nylon monofilaments	Prevents surface erosion, stabilizes soils on streambanks, encourages revegetation of disturbed soils	Installed after grading and/or compaction of streambanks is completed; may be installed over top of erosion control blanket
Erosion Control Blanket	WOVM, three dimensional matting made of curled wood fibers, with avg. fiber length = 6"	Prevents surface erosion, stabilizes soils, encourages revegetation by retaining soil moisture	Installed after grading of soils, broadcast seeding, and fertilization of disturbed area is completed
Hpdromulching	Mixture of tiny wood fibers, seed, and fertilizer mixed with water and applied by spraying	Establishes vegetation over large areas, provides stabilization to soils through encouragement of vegetation	Applied after preparation of soils by recontouring and mechanically harrowing disturbed soils
Broadcast Seeding	Mixture of seeds applied to soils by hand or machine	Distributes seeds over disturbed soils to encourage vegetative growth	Applied to soils after surface preparation; before and after installation of erosion control blanket
Fertilizer	Mixture of plant nutrients and chemicals determined by soils analysis	Encourages and stimulates vegetative growth by providing necessary nutrients	Applied to soils before or after broadcast seeding and before installation of erosion control mulch blanket
Riparian Vegetation	Shrubs, bushes, and other plants which grow along streambanks, may be transplanted or planted as cuttings	Develops a root mat in soils along streambanks, and helps retain soil and prevent erosion during flooding events	Shrubs planted following placement of riprap along streambanks; cuttings planted in spring after recession of flood flows; may be used with erosion control blankets
Fencing	Four foot high fence constructed around perimeter of stabilized and revegetated portions of study area	Controls livestock and wildlife access to stabilized and revegetated reaches and areas of project	Installed following completion of all treatments and construction in study area

vegetation measures. Revegetation of adjacent areas GG and FF also would help accomplish the second project objective. Implementation of the selected alternative would generally meet the third objective, however, it will be difficult to quantitatively measure how much improvement occurs in water quality because no monitoring data for the study area is available. The fourth objective would be accomplished by each of selected alternative components. Additional improvement in aesthetics may be realized following implementation of stabilization and revegetation measures in stream reaches B and I. The fifth objective would be partially met within the patented land area by stabilizing the low flow streambanks with riparian vegetation. Implementation of the selected alternative which meets the first four objectives would indirectly create, maintain or improve the chinook salmon spawning and rearing habitat in Bear Valley Creek.

SUMMARY

This chapter has described the components of the selected alternative, presented recommended construction treatments, and discussed the project objectives in terms of the proposed implementation measures. The selected alternative includes the stabilization and revegetation of three stream reaches and two adjacent areas within the patented land boundaries. Stream reaches B and I will be given further consideration in the field to determine the need for recommended improvements and evaluate potential alternatives. Chapter 4 presents implementation considerations of the selected alternative.

CHAPTER 4

IMPLEMENTATION OF THE SELECTED ALTERNATIVE

INTRODUCTION

This chapter provides a discussion of implementation considerations for the Bear Valley Creek Fish Habitat Enhancement Project selected alternative. The implementation considerations are those regulatory and institutional aspects of the project which must be fulfilled before construction may commence. The implementation considerations include land ownership, potential conflicts with existing and future land uses, and permit requirements and acquisition. The selected alternative is discussed below in terms of these implementation considerations.

LAND OWNERSHIP

The selected alternative involves enhancement of fish habitat and construction of erosion control measures within the boundaries of the patented land on Bear Valley Creek. The patented land is owned by Bear Valley Minerals, Inc. of Denver, Colorado, and includes 910 acres within Big Meadows. The application for patent of the six mineral claims comprising the private land was filed in July 1961 and granted on April 30, 1962 under patent number 1226626. The patent applies to both surface and mineral rights.

Bear Valley Minerals, Inc. granted an easement to the Tribes in May 1984 for conducting a feasibility study within the boundaries of the patented land. The current easement allows the Tribes access onto the patented land for study and evaluation purposes only. A new easement and additional written agreements between Bear Valley Minerals, Inc. and the Tribes will have to be executed before any construction activities may begin. The new easement will supercede the current easement, and Bear Valley Minerals, Inc. has overall control over implementation of the improvements designed to stabilize the patented land and protect downstream fish habitat.

There will be no National Forest System lands involved with the construction of the selected alternative in Big Meadows. However, the necessity to develop an adequate source of riprap for streambank stabilization will require locating a quarry site on National Forest land outside of the Big Meadows area. There are currently two established sites that have been used by the USFS as a source of riprap located within the Bear Valley Creek drainage. An additional potential source of riprap for the project may be on Yhitehawk Mountain, which is part of the National Forest System land under management hy the Lowman Ranger District, Boise National Forest. Permitting requirements for use of National Forest System lands as a source for riprap are discussed later in this chapter.

POTENTIAL CONFLICTS WITH EXISTING AND FUTURE LAND USES

The existing and future land uses of the study area must be considered in the implementation of the selected alternative. The primary existing and future land uses of the patented land are grazing operations and potential mineral development activity. Potential effects of the selected alternative on the existing grazing operations are discussed in Chapter 6 of this report. Other existing land uses within the patented land include wildlife habitat and specifically potential habitat for the Northern Rocky Mountain gray wolf, transportation and access, and public recreation. Construction activities associated with implementing the selected alternative may have a short term effect on wildlife inhabiting the patented land. The fencing may exclude some wildlife from presently utilized areas, however, the majority of the area in question is currently in poor vegetative condition in terms of its grazing or browsing potential. The potential conflicts with the gray wolf are discussed in a separate biological evaluation report being prepared as part of this project. Vehicular transportation on the roads within the patented land may be affected during construction of the improvements, however, the project at completion will have no significant effect on access. Recreation involving the existing shallow ponds or other portions of the patented land is currently limited but would be further discouraged with fencing in order to protect the stabilization and revegetation efforts.

Potential future mining of the patented land in Bear Valley could have moderate conflicts with the selected alternative. The entire length of stream reaches D, E, and G is adjacent to the previously mined tailing deposits on the east and unmined land on the west. Adjacent area GG also borders lands which could be mined by Bear Valley Minerals, Inc. The selected alternative could be compatible with potential mining activity if a buffer strip is maintained between the west bank of the stream reaches and future mining panels. Bear Valley Minerals, Inc. or the mining operator would have to construct diversions around the area north of the bridge crossing in Section 15 in order to conduct future mining activity. Stabilization of reach G could be in conflict with future mining activity as it apparently contains unmined and proven mineral resource values. Bear Valley Minerals, Inc. has indicated an interest in maintaining a portion of adjacent area FF as a staging area for construction related to potential future mining activity. It should be noted that no additional mining could take place without a modification of the current regulations limiting dredge mining in the Middle Fork Salmon River drainage. None of the elements incorporated into the selected alternative would in any way curtail or preclude future mining or reclamation.

PERMlT REQUIREMENTS AND ACQUISITION

The permits, actions, and/or approvals required for the selected alternative will have to be acquired prior to beginning construction activities. Tbe permit requirements and a best case acquisition schedule are discussed below.

Permit Requirements

The Bear Valley Creek Fish Habitat Enhancement Project will require permits, approvals, and/or actions from various Federal and State agencies. Some of the regulatory agencies responsible for permitting the project are represented on the Interagency Task Force. The permit requirements were initially discussed in the Bear Valley Fish Habitat Enhancement Project Technical Memorandum No. 3

(JMN, 1985). The permits, actions, and/or approvals required for the selected alternative are listed below along with the responsible agency.

- NEPA Compliance - Bonneville Power Administration
- Section 7, Endangered Species Act, Biological Evaluation of Gray Wolf (Informal Consultation) - USDI-Fish and Wildlife Service
- Wild and Scenic Rivers Consultation - USDA and USDI
- Special Use Permit, Road Use Agreement for Commercial Hauling - USDA-Forest Service
- Special Use Permit, Construction Material Source (Riprap) on National Forest System Land - USDA-Forest Service
- NPDES Applicability Determination - U.S. Environmental Protection Agency
- Section 404 Permit - U.S. Army Corps of Engineers
- Compliance with Executive Order 11988 (Floodplain Management) and 11990 (Protection of Wetlands0 - U.S. Army Corps of Engineers
- Stream Channel Alteration Permits - Idaho Department of Water Resources
- "Special Resource Water" Consultation - Idaho Department of Health and Welfare, Division of Environment

Each of these permits, actions, consultations, and/or approvals must be obtained prior to commencement of construction activities. The permit application preparation process will require significant lead times, and some of the permits can only be granted with submittal of detailed engineering design drawings and specifications. The permitting requirements for the selected alternative are summarized in Table 4-l by regulatory agency, permit or action, lead time for permit preparation, agency review time, and duration of the permit. Pertinent comments are included with the permitting requirements summary in Table 4-l. The permit preparation lead times and comments are based on prior permitting experience and information gathered from the specific agencies. Permits or approvals which involve completing simple forms, applications, correspondence or notifications are denoted "minimal" in Table 4-l. The agency review times are based on actual statutes, where applicable, and on agency practices. The agency review periods depend upon a number of factors, including availability of information and efficiency of review personnel.

Permit Acquisition Scheduling

Implementation of the selected alternative will involve the acquisition of all required permits within a specified time period. A permit acquisition schedule

TABLE 4-1

PERMITTING REQUIREMENTS SUMMARY
FOR BEAR VALLEY CREEK FISH HABITAT ENHANCEMENT PROJECT

Regulatory Agency	Permit or Action	Lead Time (Months) for Permit Preparation	Agency Review Time (Months)	Duration	Comments
Dept. of Defense, U.S. Army Corps of Engineers (COE)	Permit for discharge of dredged or fill material (404 permit)	2-3	2-6	Life of activity	May be required, based on dredge and fill quantities for the selected alternative. Can involve significant lead times, and potentially trigger EIS process. Detailed engineering design required for permit. Construction must commence within 1 year of issuance (33 CFR 320 et. seq.).
	Compliance with Executive Orders 11988 (Floodplain Management) and 11990 (Protection of Wetlands)	1-3	2-6	Life of activity	A determination may be made by the Army COE following on-site inspection of the areas proposed for construction activity. If the affected area is determined a floodplain or wetland, the Army COE may require additional information to be submitted with the 404 permit application. A positive determination may also trigger an EIS or EA process.
State Department of Water Resources	Stream Channel Alteration Permit	2-3	2-3	Life of activity	Stream channel alteration permit may be submitted on a joint IDWR/Army COE application. IDWR also requires detailed design drawings and specifications for permit. Separate permit applications must be submitted for each stream channel alteration site. Other Idaho agencies have comment opportunity on permit applications.
U.S. Fish & Wildlife Service (USFWS)	Consultation process for Endangered or Threatened Species (Section 7) Gray Wolf	1	2	Life of activity	This consultation has been initiated. The USFWS has indicated that an informal consultation will be adequate for this project. The informal consultation will require preparation of a biological evaluation on the gray wolf.
U.S. Environmental Protection Agency (EPA)	National Pollutant Discharge Elimination System (NPDES) applicability determination	1-2	6 (minimum for permit issuance)	5 years	An official applicability determination should be secured from EPA. This process should be initiated immediately, including investigating the potential to secure a waiver and/or temporary permit covering construction activities.
National Environmental Policy Act (NEPA)	Compliance with NEPA	2-12	6	Life of activity unless project significantly modified.	The NEPA compliance process is being conducted by BPA. Compliance is required by all federal agencies under NEPA when actions involving the agencies could result in or lead to significant impacts on the human environment.

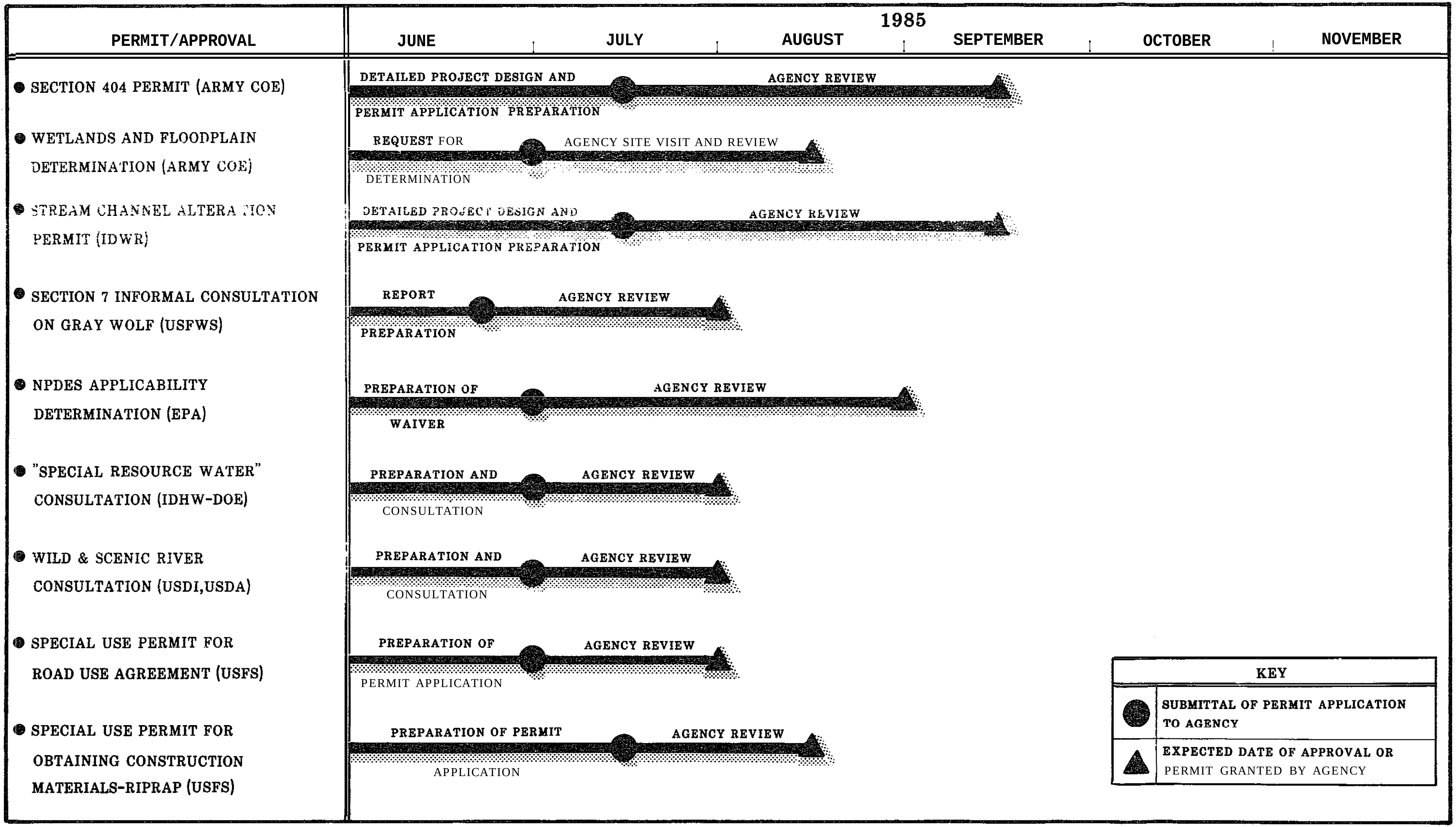
TABLE 4-1 (cont.)

Regulatory Agency	Permit or Action	Lead Time (Months) for Permit Preparation	Agency Review Time (Months)	Duration	Comments
State of Idaho Water Quality Standards "Special Resource Water Designation"	Written consultation with IDHW-DOE regarding any potential special mitigation requirements during construction, BMP application, and special noncompliance waivers, etc.	Minimal (consultation)	2	Construction period	The stream course which will be affected by project construction is presently classified as a "Special Resource Water." This is due to outstanding high quality, its inclusion in the National Wild and Scenic River System, and the paramount interest (both statewide and national) in the watercourse. Accordingly, any proposal to modify the stream course which would involve either temporary or long-term water quality degradation may be subject to special review and/or provisions by IDHW. It is recommended that early consultation with the DOE be initiated, for these reasons.
Wild & Scenic River System Classification (16 U.S.C. 1271-1287)	Written consultation with the Department of Interior and Department of Agriculture	Minimal (consultation)	2	Consultation period	The Tribes should formally consult (notify) the Secretary of the Interior and Secretary of Agriculture in writing of its intentions regarding the Bear Valley Creek Fisheries Habitat Enhancement project, and the selected alternative. This consultation is important from a documentation aspect.
USDA-Forest Service	Special Use Permit for access and egress needs (commercial use)	Minimal (Road Use Estimates)	2-3	Annual requirement	Permit will be required for any hauling and commercial road use. Depending on the construction schedule, this may also involve snow removal. The actual permit preparation times are short, and involve such submittals as estimated road use by vehicle type.
	Special Use Permit for obtaining riprap (rock construction material) from and approved site	1	2-3	Annual requirement	There are several potential sites on the Boise National Forest in the Bear Valley Creek drainage which could be a source of riprap. These sites will have to be further studied in the field with USFS personnel. The permit will be issued by the Lowman Ranger District, and the acquisition of this permit should be initiated as soon as possible.

has been developed to help coordinate the preparation, submittal and approval of the required permits that will allow construction to commence (Figure 4-l). A delay in preparation and/or submittal of certain permit applications may result in postponing construction of key components until the 1986 season. The Bear Valley Creek project area has a definite construction "window" or season which lasts from mid-July through late October or when the first snowfall occurs. Some permitting activities are dependent on certain necessary field studies and data verification during the spring and summer season, 1985 (Figure 4-l).

SUMMARY

This chapter has discussed land ownership of the patented land, provided an overview of potential conflicts with existing and future land uses, and presented permitting reuqirements and a permit acquisition schedule, related to implementation of the selected alternative. These aspects of the project must be completed and/or resolved prior to beginning the construction effort. Construction considerations related to the project are discussed in Chapter 5.



1985 PERMIT ACQUISITION SCHEDULE
BEAR VALLEY CREEK FISH HABITAT
ENHANCEMENT PROJECT

FIGURE 4-1

CHAPTER 5

CONSTRUCTION CONSIDERATIONS FOR THE SELECTED ALTERNATIVE

INTRODUCTION

This chapter provides estimated construction quantities, a refined preliminary cost estimate, and a discussion on phasing of construction and construction scheduling, for the selected alternative. Information included in this chapter of the report is refined from that presented in the Draft Feasibility Report (JMM, 1985), and mill be used to guide design of the selected alternative for the Bear Valley Creek Fish Habitat Enhancement Project. Construction considerations for the selected alternative are discussed below.

ESTIMATED CONSTRUCTION QUANTITIES

The construction quantities for the selected alternative were estimated in order to develop a preliminary cost for the project. These estimated constructed quantities were made using information derived from 11 topographic maps of the study area (Bear Valley Minerals, Inc., 1985) with two foot contours at a horizontal scale of one inch equals 100 feet, and 2) USFS cross sections on the patented land. All quantities presented in this report are estimates which will be verified during design.

A number of assumptions have been made in order to develop the estimated construction quantities. Excavation volumes for construction of the floodplain in stream reaches D and E were developed using the cro.ss sections shown in Figure 3-l. The volumes for loading, hauling, compaction, grading and riprap were obtained from the one inch equals 100 feet (100 scale) topographic maps. Surface areas for stabilization and revegetation in the stream reaches and adjacent areas also were made using the 100 scale topographic maps. Preliminary sizing of the floodplain construction was accomplished using a hydraulic section method for open channel flow from Chow (1959). Key assumptions for the hydraulic section calculations include: 1) floodplain boundary side slopes of 3 to 1; 2) stream channel gradients shown in the sections on Figure 3-l; 3) Manning's coefficient of friction estimated at 0.050; 4) floodplain channel width estimated at 180 feet; 5) peak streamflows estimated from the 1974 snowmelt runoff as modeled using the HEC-I computer model (Draft Feasibility Report, JMM, 1985); and 6) channel freeboard estimates made using recommended freeboard and height of bank guidelines from Chow (1959!. The assumed floodplain widths will be verified during the design phase using the HEC-2 backwater profile computer model.

Geotextile fabric for stabilization of floodplain channel side slopes was assumed to extend to a depth of two feet below the stream channel invert and extend out five feet from the toe of the slope. The geotextile fabric also was assumed to extend three feet out from the top of the floodplain channel slope. Erosion ***control*** blankets for revegetation were assumed to cover the inboard banks and outboard areas associated with the floodplain. The geotextile fabric and erosion control blankets were assumed to be anchored with wood and/or wire stakes, placed at three foot centers. Riprap for anchoring the geotextile fabric at the toe of the floodplain channel bank was assumed to extend to a depth two feet below the stream channel invert, and one foot above the depth of the design peak flow in the floodplain channel.

The estimated construction quantities for the selected alternative are presented by component in Table 5-l. These estimated construction quantities were calculated based upon the assumptions stated above.

PRELIMINARY COST ESTIMATE

The preliminary cost estimate is based on preliminary estimates of quantities for the various components of the selected alternative. Unit costs for materials, equipment, labor, and other items have been compiled from various sources including local contractors, manufacturers. other current construction projects in the region, and the Means Site Work Cost Data 1985 and Building Construction Cost Data 1985 estimating manuals (Means, 1985). The preliminary cost estimates for the components of the selected alternative represent feasibility level estimates. Estimates of costs for mobilization and demobilization, contingencies, special construction techniques, engineering and surveying services, administration and legal services, and construction management are included.

Unit Costs for Construction and Other Costs

The unit costs presented in this report include material costs, construction equipment costs, labor costs, and contractor's/subcontractor's overhead and profit. All unit costs are established at April 1985 levels and keyed to an Engineering News Record (ENR) construction cost index value of 4200. The ENR index is based on an average construction cost for 20 selected cities in the U.S. and may be utilized to update the costs used in this report by comparing the ENR construction index value to the April 1985 index value of 4200. The ENR index will be used to update the estimated costs of construction planned for the 1985 and subsequent construction seasons. The unit costs for the various construction elements anticipated for the Bear Valley Creek project are presented in Table 5-2. These unit costs are applied to the quantities listed in Table 5-l to compute the unweighted estimated construction costs presented later in this chapter. Mobilization and demobilization costs were estimated based on equipment requirements for the project and an assumed work camp location 17 miles from the construction site in Lowman, Idaho.

The other costs associated with construction are included as a percentage of the estimated unweighted construction cost as shown below.

- contingencies @ 25 percent of the total estimated construction cost

- special construction techniques including wet excavation, stream channel work, and mountain meadow environment @ 10 percent of the total estimated construction cost

TABLE 5-l

ESTIMATED QUANITIlES FOR CONSTRUCTION
OF THE SELECTED ALTERNATIVE

	Component	Unit	Value
1.	Stabilization and Revegetation of Reach D		
	Excavation	cu yd	44,000
	Loading and Hauling	cu yd	44,000
	Fill and Compaction	cu yd	36,000
	Grading and Leveling	cu yd	22,000
	Riprap	cu yd	1,500
	Geotextile Fabric	sq yd	10,000
	Erosion Control Blanket, Seeding and Fertilization	sq yd	15,500
	Riparian Revegetation	sq yd	3,500
	Floodplain Revegetation	sq yd	20,000
2.	Stabilization and Revegetation of Reach E		
	Excavation	cu yd	30,000
	Loading and Hauling	cu yd	30,000
	Fill and Compaction	cu yd	26,000
	Grading and Leveling	cu yd	15,000
	Riprap	cu yd	1,000
	Geotextile Fabric	sq yd	8,000
	Erosion Control Blanket, Seeding and Fertilization	sq yd	14,000
	Riparian Revegetation	sq yd	4,000
	Floodplain Revegetation	sq yd	16,000
3.	Stabilization and Revegetation of Reach G		
	Excavation	cu yd	6,000
	Fill and Compaction	cu yd	6,000
	Riprap	cu yd	1,200
	Geotextile Fabric	sq yd	4,000
	Erosion Control Blanket, Seeding and Fertilization	sq yd	6,200
	Riparian Revegetation	sq yd	1,000
4.	Stabilization and Revegetation of Adjacent Area GG		
	Excavation	cu yd	200
	Fill and Compaction	cu yd	200
	Grading and Leveling	cu yd	200
	Riprap	cu yd	60
	Geotextile Fabric	sq yd	700
	Erosion Control Blanket, Seedind and Fertilization	sq YO	5,000

TABLE 5-1 (cont.)

Component		Unit	Value
5.	Stabilization and Revegetation of Adjacent Area FF		
	Excavation	cu yd	1,000
	Fill and Compaction	cu yd	1,000
	Grading and Leveling	cu yd	1,000
	Riprap	cu yd	300
	Geotextile Fabric	sq yd	2,000
	Erosion Control Blanket, Seeding and Fertilization	sq yd	3,000
	Other Seeding and Hyromulching	sq yd	145,000
6.	Minor Components		
	Fencing	lin ft	13,000
	Erosion Control Blanket, Seeding and Fertilization	sq yd	7,000
	Other Seeding and Hydromulching	sq yd	28,000

TABLE 5-2

ESTIMATED UNIT COSTS FOR CONSTRUCTION OF THE
BEAR VALLEY Creek FISH HABITAT ENHANCEMENT PROJECT
(ENR INDEX OF 4200)

	Item (Description)	Estimated Cost $	Unit
1.	Excavation (Backhoe, Scraper, and Loader-average)	2.90	cu yd
2.	Excavation (Dozer)	3.70	cu yd
3.	Grading and Leveling (Dozer)	2.0Q	cu yd
4.	Fill and Compaction (Dozer and Roller/Blade)	1.50	cu yd
5.	Loading and Hauling (Loader and 12 yd Dumper - 2 nile round trip haul)	1.50	cu yd
6.	Riprap (Assumes nearby source, drilling, shooting, loading, hauling, machine placement--dumping)	55.00	cu yd
7.	Geotextile Fabric	7.00	sq yd
8.	Erosion Control Blanket, Seeding and Fertilization	1.90	sq yd
9.	Hydromulching (seeds, fertilizer, fibers, and tackifier; application)	0.50	w yd
10.	Broadcast Seeding	0.35	sq yd
11.	Fertilization	0.15	*q yd
12.	Riparian Vegetation Planting and Transplanting	10.00	sq yd
13.	Floodplain Revegetation	1.50	sq yd
14.	Fencing	0.75	lin ft

These costs are added to the estimated unweighted construction cost, and a subtotal estimated construction cost is obtained for the selected alternative. The engineering and surveying, administrative and legal, and construction management services costs are estimated as a percentage of the subtotal estimated construction cost as shown below.

- engineering and surveying @ 10 percent, assuming a limited level of design and a negotiated construction contract
- administrative and legal services @ 4 percent
- construction management services @ 15 percent, assuming a turnkey type design/construction contract

The engineering and surveying cost estimate is based on median compensation for services as shown in <u>ASCE Manuals and Reports on Engineering Practice No. 45</u> (ASCE, 1975). The engineering and surveying includes: 1) limited design in the office to a level which can be presented in drawings and specifications to a construction subcontractor; 2) field verification of engineering assumptions; and 3) field surveying for construction quantities. The construction management services cost estimate is based on JMM experience working in field conditions, and includes: 1) significant field engineering; 2) construction monitoring; 3) responsibility as the general contractor; 4) construction scheduling; 5) reporting; and 6) completing record drawings.

Preliminary Construction Cost Estimate

The preliminary construction cost estimate is a feasibility level estimate which is approximate and computed without detailed engineering data or design. JMM typically assumes an accuracy of plus 50 percent and minus 30 percent for this level of preliminary cost estimate. However, this construction cost estimate has been refined over that presented in the Draft Feasibility Report (JMM, 1985). The construction cost estimate for the selected alternative is summarized in Table 5-3. The construction cost estimate is summarized in terms of the six components of the selected alternative. The preliminary cost estimate (ENR 4200) for the selected alternative is $2,458,000.

PHASING OF CONSTRUCTION

The construction of the selected alternative will have to be phased over two or more years because of the following:

1. The amount of restoration work necessary cannot physically be completed in 1985 given the relatively limited construction season.

2. Vegetation test plots to be established and monitored during 1985 and 1986 will determine much of the revegetation strategy.

3. Stream reaches B and I must he given further consideration in the field before determining the need for and extent of improvements. Such determination may not be made until July 1985.

TABLE S-3

Preliminary CONSTRUCTION COST ESTIMATE
FOR THE SELECTED ALTERNATIVE
BEAR VALLEY CREEK FISH HABITAT ENHANCEMENT PROJECT
(ENR 4200)

	Component		Cost
1.	Stabilization and Revegetation of Reach D		$ 575,000
2.	Stabilization and Revegetation of Reach E		427,000
3.	Stabilization and Revegetation of Reach G		147,000
4.	Stabilization and Revegetation of Adjacent Area. GG		19,000
5.	Stabilization and Revegetation of Adjacent Area FF		116,000
6.	Minor Components		37,000
7.	Mobilization/Demobilization		90,000
		Subtotal	$ 1,411,000
	Contingencies ,@ 25%		353,000
	Special Construction Techniques @ 10%		141,000
		Subtotal	$ 1,905,000
	Engineering and Surveying @ 10%		191,000
	Legal and Administration $3 4%		76,000
	Construction Management Services @ 15%		286,000
	TOTAL PRELIMINARY COST ESTIMATE		$ 2,458,OOO

4. The amount of annual funding available for design and construction activities for this project will require phasing of the construction.

Phasing of the construction planned for the patented land in Bear Valley will affect the overall project cost in several ways. Mobilization and demobilization will occur during construction season, and this cost must be added to the remaining project cost for each additional construction season. The materials, labor, and equipment are subject to inflation between the construction seasons, and these costs must be increased to allow for inflation. A conservative estimate for annual inflation is ten percent, which should be applied to the cost of the remaining work. Some construction materials mill be purchased directly from the manufacturer, and when such materials are ordered in large quantities, the unit cost is decreased. These construction materials may not be fully installed during one construction season, and the cost to store the materials for use the next year versus a higher unit cost for a smaller quantity must be cornpared. Tbe engineering design work associated with the project will mostly be conducted prior to and during the first construction season. However, some engineering and surveying work will have to be undertaken in the second and any subsequent construction seasons. The need for additional engineering work may be greater than anticipated in subsequent construction seasons if the project sitecannot be fully stabilized at the end of each construction season due to early winter conditions or an extremely wet spring. Changes in the scope of the project between phases of construction also may change the overall project cost.

There are many possible combinations of these and other factors which may influence the cost of a project because of phasing construction over several seasons. A hypothetical example of the effect of phasing construction of the selected alternative is presented in Table 5-4. The annual funding available for construction of the project is assumed to be $500,000 in the example. Inflation is assumed to be 10 percent per year. Mobilization and demobilization costs are added each year and are assumed to inflate at 10 percent per year. The example presented in Table 5-4 indicates that given these assumptions, the phasing of construction could extend the construction over seven years at a. total estimated construction cost of approximately $3,519,000.

CONSTRUCTION SCHEDULING

The construction schedule for the selected alternative will be dependent upon how the project is phased and the funding available for each construction season. It will be essential to schedule construction activities such that the progress each season is maximized by using on-site equipment as efficiently as possible. It will be equally important to schedule interim stabilization of each unfinished work area between the construction seasons.

The 1985 construction activities will begin in mid-July or August and extend through mid to late October. It is recommended that the most severe eroded sections of stream reach D be stabilized during the 1985 season. The amount of construction on stream reach D which could be completed during the 1985 season, given an assumed level of funding at $500,000, is approximately 67 percent

TABLE 5-4

HYPOTHETICAL EXAMPLE
EFFECT OF CONSTRUCTION PHASING ON OVERALL PROJECT COST
BEAR VALLEY CREEK FISH HABITAT ENHANCEMENT PROJECT

Construction Season	Cost to Complete Construction ($)	Dollar Amount of Annual Construction ($)	Unadjusted cost[a] of Remaining Construction ($)	Inflation (10%) on Remaining Construction Costs[b] ($)	Mobilization & Demobilization costs[c] ($)	Total Remaining cost to Complete Construction[d] ($)
1985	2,388,000[e]	500,000	1,888,000	188,800	55,000	2,131,800
1986	2,131,800	500,000	1,631,800	162,200	60,500	1,855,500
1987	1,855,500	500,000	1,355,500	135,600	66,600	1,557,700
1988	1,557,700	500,000	1,057,700	105,800	73,300	1,236,800
1989	1,236,800	500,000	736,800	73,700	80,600	891,100
1990	891,100	500,000	391,100	39,100	88,700	518,900
1991	518,900	518,900	-0-	-0-	-0-	-0-
TOTAL		$ 3,518,900[f]				

[a] Unadjusted cost does not include inflation on balance carried forward to next year or mobilization/demobilization costs.

[b] Inflation assumed to be 10% per year. This cost is carried forward to the next year.

[c] Mobilization/Demobilization costs are inflated at 10% per year and carried forward to the next year.

[d] This cost is forwarded on to the next year as the cost to complete construction.

[e] ENR Index Value = 4200. This cost is adjusted to account for mobilization & demobilization at $50,000 for the first construction season.

[f] This total represents the total estimated construction cost of the project over the phased construction period.

of the construction ultimately planned for the reach. The stabilization which could be accomplished ***in*** 1985 may include floodplain excavation and ***construc-*** tion, erosion control blanket and geotextile fabric installation, riprap placement, seeding, and some riparian revegetation on those portions of reach D with existing vertical streambanks. The material excavated from reach D in 1985 would be used to fill the flat area north of reach E. The fill material would be compacted and temporarily stabilized with stockpiled riprap and a mixture of annual grasses.

The construction scheduled for future years will be better defined following the design phase and the 1985 construction season. The phasing of the project may extend the period of construction for a number of years, and the construction schedule must remain flexible to meet the most immediate needs of stabilizing and revegetating the patented land.

SUMMARY

This chapter has provided estimated construction quantities, a preliminary cost estimate, and discussions on phasing and scheduling of construction, for the selected alternative. The selected alternative has a total preliminary estimated cost of approximately $2.5 million. Construction will have to be phased over a number of years, which will increase the overall cost of project at completion due to inflation. The 1985 construction schedule includes stabilization of the severely eroded portions of stream reach D.

CHAPTER 6

LIVESTOCK ACCESS PLAN

INTRODUCTION

This chapter presents a livestock access plan for the selected alternative on the patented land in Bear Valley. FOUR types of fencing are analyzed in terms of construction effort, estimated cost, effectiveness, reliability, operations and maintenance requirements and costs, acceptability, and duration of service. A recommendation is made for the type of fencing best meeting the criteria listed above. Livestock crossings also are discussed in terms of these criteria. The potential effects of the selected alternative on livestock access and utilization within the boundaries of the patented land are presented at the end of this chapter.

The fencing will be required as part of the selected alternative to protect the investment in stabilization materials and revegetation efforts. Livestock and wildlife which graze on the patented land will have to be excluded from the stabilized areas to allow the new vegetation to become established. It is important to remember that the fence may only help control the livestock movement within the meadow but will not keep all animals out of the revegetated areas. The purpose of the fencing will be to discourage animal use of the stabilized areas.

The Big Meadows area is part of a three pasture rest-rotation system called the Bear Valley Allotment which is managed by the USFS. The Big Meadows pasture provides approximately 1527 animal unit months (AUM's) out of a total ranging from 3089 AUWs to 3280 AUM's available for utilization when Big Meadows is in the grazing rotation. The rest-rotation system involves resting one pasture and grazing the other two pastures during any given year. The system is on a three year cycle, which means that during any three year period, a pasture will be grazed for two years and rested **for** one year. The USFS currently has three permittees which graze livestock in the Bear Valley Allotment. These permittees are David Little, the MacGregor Land and Cattle Company, and Callendar & Beckman. The Big Measows pasture is scheduled to be grazed in the early summer months of 1985 and the late summer months of 1986. A total of 857 cattle graze on the Bear Valley Allotment each year between the three permittees, and the grazing season lasts from July 1 to October 15. The pastures are separated by fences which are maintained by the USFS.

The patented land is grazed. by livestock when the Big Meadows pasture is in the grazing rotation. There are no fences separating the patented land from the National Forest System land, and the livestock move freely throughout the Big Meadows pasture. The existing grazing operators utilize the patented lands in Bear Valley by permission from Bear Valley Minerals, Inc., which is the owner of the patented lands.

The area of the patented land proposed for fencing is shown in Figure 3-1, and includes the eroding stream reaches and disturbed adjacent mine tailing. The fencing would completely surround the proposed improvements at a length of approximately 13,000 feet. The area is estimated to have a limited number of AUWs as compared to surrounding pasture land. Most of the area proposed to be fenced currently supports no significant vegetation. The revegetation efforts will be conducted to develop new vegetative communities in the disturbed areas which could eventually provide additional AUM's on the patented land. A brief analysis of the types of fencing which could be used to exclude livestock from the improved portions of the patented land is presented in the next section.

DESCRIPTION AND EVALUATION OF FENCING ALTERNATIVES

This section presents a description and evaluation of the fencing alternatives considered for excluding livestock from the improved areas on the patented land. The fencing alternatives are analyzed and evaluated in terms of various criteria developed for the project. These criteria include:

- Constructability
- Reliability and Effectiveness
- Acceptability
- Duration of Service
- Estimated Cost
- Operation and Maintenance Requirements and Costs

4 recommendation for the type of fencing which should be used is made based on the evaluation.

There are several constraints which must be considered in the analysis of the fencing alternatives. The patented land in Bear Valley is remote and any fencing must have low operation and maintenance requirements. The area receives deep snowpacks during the minter months which exert heavy loads on fences. The meadow area is either wet or inundated during spring runoff. The existing vegetation may grow to a height of two feet in the undisturbed areas when the pasture is in the rest cycle. The fence must have a duration of up to ten years which will allow the new vegetation to become established.

Description of Fence Types

Four types of fencing are considered in the analysis including: 1) New Zealand type electric fences; 2) jackleg fences; 3) post and pole fences; and 4) laydown barbed wire fence. The New Zealand type electric fence consists of three high tensile steel wires mounted on self-insulating solid fiberglass poles, and features high-powered energizers that send short-duration, high amperage impulses through the wires. The energizers can be adjusted to send from 11 random pulses up to 60 regulated pulses per minute, and may be powered by a 12-volt battery and solar cell recharge system. The jackleg fence is comprised of wooden poles stacked horizontally in a "zig-zag" pattern overlapping the pole ends. The post and pole type fence is constructed using wooden posts with the ends buried at least two feet deep and wooden poles attached horizontally between the posts.

The laydown barbed wire fence consists of steel posts with the ends buried at least 30 inches deep and four strands of barbed wire attached to the posts using "Davison clips." Wooden "dancer" poles are attached vertically to the barbed wire at 80 foot intervals, and the "Davison clips" are turned to release the wire from the steel posts in the fall, allowing the fence to be layed down over the winter. The "dancer" poles keep the barbed wires from becoming tangled after they are laid down in the fall. The wires are reinstalled each spring on the steel posts using the "Davison clips" after the snow melts away.

Evaluation of Fencing Alternatives

Each of these fences could be constructed to a height of four feet to exclude livestock from the revegetated areas. The performance of each fence is variable given the constraints discussed earlier. The four different types of fence are evaluated in the following subsections based on the criteria presented at the beginning of the previous section.

Constructability. The New Zealand type electric fence, an post and pole fence, each require a higher level of construction as compared to the other two types of fences. The electric fence involves constructing a system which not only repels livestock with impulses of electricity but also must accommodate winter snow loads. The electric fence system can be designed to provide flexibility for winter snows, however, such design features increase the complexity of construction and the cost. The post and pole fence requires augering or digging of holes for setting the posts and attaching the poles so the fence will remain intact over its period of service. This involves more construction per length of fence than the other three types of fences included in this evaluation. The jackleg fence is easily constructed in relatively flat areas such as Big Meadows. The laydown barbed wire fence also involves simple construction. The steel posts are driven into the ground with a hand operated fence post driver and the wires are attached to the posts with the clips. The "Davison clips" require a special hand tool to attach the wire to the post. The laydown fence can be installed by two workers at a rate of 1300 feet per day.

Reliability and Effectiveness. The four types of fences have varying degrees of reliability and effectiveness. The New Zealand type electric fence can be unreliable because of grounding problems with water and high growing vegetation. The electric fences are sometimes vandalized because the solar recharging system is an attractive item. Electric fences can be ineffective if livestock have not been exposed to them, and some cattle will disregard electric shocks to get through the fence. Jackleg fences are generally reliable, however, the high water may displace pieces of the fence as it becomes older. Jackleg fencing also may be affected by snow loads. The jackleg fence cannot be used in the floodplain or crossing the stream, because it will eventually fail if debris piles up against the side of the fence during high water. Jackleg fences are mostly effective in controlling livestock, however, cattle can sometimes push the fencing over by rubbing against weak sections. Post and pole fencing is generally reliable, however, the wet meadow conditions of the patented land may cause the fence posts to rot in several years. The fence posts can be treated before installation, but the treatment may only extend their life by several years. Post and pole fences cannot be used in the floodplain or crossing the stream because of debris pileup during high water. The post and pole fences are effective for excluding livestock unless a pole breaks and allows cattle entry to the re-vegetated area. The laydown barbed wire fence is the most reliable because it is not affected by snow loads, the steel posts will not be affected by wet meadow conditions, and it can be used in the floodplain and across the stream. The barbed wire can rust over time, however, it generally lasts longer than ten years. The laydown fence is expected to have good effectiveness for excluding livestock as barbed wire is used in range areas throughout the region (Don Justus, personal communication, 1985!.

Acceptability. The four types of fences have different levels of acceptability among grazing operators and range managers. The New Zealand type electric fence is not widely used and relatively new to the Northwest. The post and pole fence and jackleg fence are aesthetically pleasing and used throughout portions of Idaho. The laydown barbed wire fence appears to be acceptable to both grazing operators and range managers in areas where heavy snows accumulate during the winter months (Justus, personal communication, 1985; Kriz, personal communication, 1985).

Duration of ***Service.*** The four fencing alternatives would probably have different durations of service because of the environmental conditions in Bear Valley. The electric fence could be expected to last ten years, however, this more complex fencing system has more parts that can fail or be put out of service. The jackleg fence is generally expected to have a duration of service exceeding ten years. The post and pole fence may not last ten years because of the potential for the posts to rot in the wet soil. The laydown barbed wire fence has a duration of service which exceeds ten years.

Estimated Cost. The estimated costs of the four fencing alternatives are made based on April 1985 unit prices for a four foot high fence installed in Rear Valley. These estimated costs include materials, equipment, and labor for construction of the fences. Operation and maintenance costs are not included in the estimated cost. The total length of the fence is assumed to be 13,000 feet for each alternative, and includes two stream crossings. The unit costs and total estimated cost for each alternative is presented in Table 6-1. The laydown barbed wire fence has the lowest total estimated cost.

Operation and Maintenance Requirements and Costs. The fencing alternatives have different operation and maintenance requirements and costs. The New Zealand type electric fence has to be checked regularly to insure proper operation and that the system is not grounding out. The manufacturers recommend clearing grass and other vegetation along the fence line regularly to help prevent grounding of the electrical system. The electric fence is maintenance intensive and would probably require a total of two man-weeks per year, in addition to any repairs which have to be made. The estimated cost of annual operation and maintenance for the New Zealand type electric fence is approximately $1,500-$2,000 (April 1985 dollars). The jackleg fence and post and pole fence both have very low operation requirements. The post and pole fence has potentially moderate maintenance requirements and costs if the wooden posts rot because of the wet soils. It is difficult to estimate an annual cost for maintenance of the post and pole fence and jackleg fence, however, a figure of 2 man-days at $400 per average year (April 1985 dollars) may be assumed for checking and repair of each type of fence. The laydown barbed wire fence has relatively low operation and maintenance requirements and costs. The fence is laid down in the fall which would require a two man crew for one half day. The fence is put up in the spring following the peak of the runoff and would require a two man crew one half day to complete the job. An additional half day would be spent making minor repairs when the fence is put up in the spring. The total annual operation and maintenance requirements would be three man days at $600~$1,000 per year (April 1985 dollars) including miscellaneous parts for repair and labor.

Recommended Fencing Alternative

The recommended fencing alternative for enclosing the improved areas on the patented land in Bear Valley is the laydown barbed wire fence. This fencing alternative is easily constructable, reliable, effective, generally acceptable, will provide over ten years of service, and has the lowest estimated cost of the four types of fence evaluated. The laydown barbed wire fence has low to moderate operation and maintenance require.ments and costs. The fence must be laid down in the fall and put back up in the spring each year. The use of “Davison clips” in the laydown fence reduces the operation and maintenance time required during the spring and fall. The laydown fence also can be easily phased with the construction of the selected alternative. Extension of the fence around areas improved during the second and subsequent years of construction can be easily accomplished.

LIVESTOCK CROSSINGS

There are no anticipated livestock crossings to be constructed as part of the improvements planned for the patented land in Bear Valley. The fencing will not extend across the road at the bridge in Section 15, but would be constructed parallel to the upstream side of the road and bridge. This will allow for movement of livestock across the bridge and not require installation of cattle guards in the roadway. The livestock will be restricted from crossing the stream by the fence enclosing the improved reaches, but animals may still cross the stream unimpeded downstream of the bridge in Section 15 and upstream of reach D.

EFFECTS OF SELECTED ALTERNATIVE AND RECOMMENDED FENCING ON LIVESTOCK

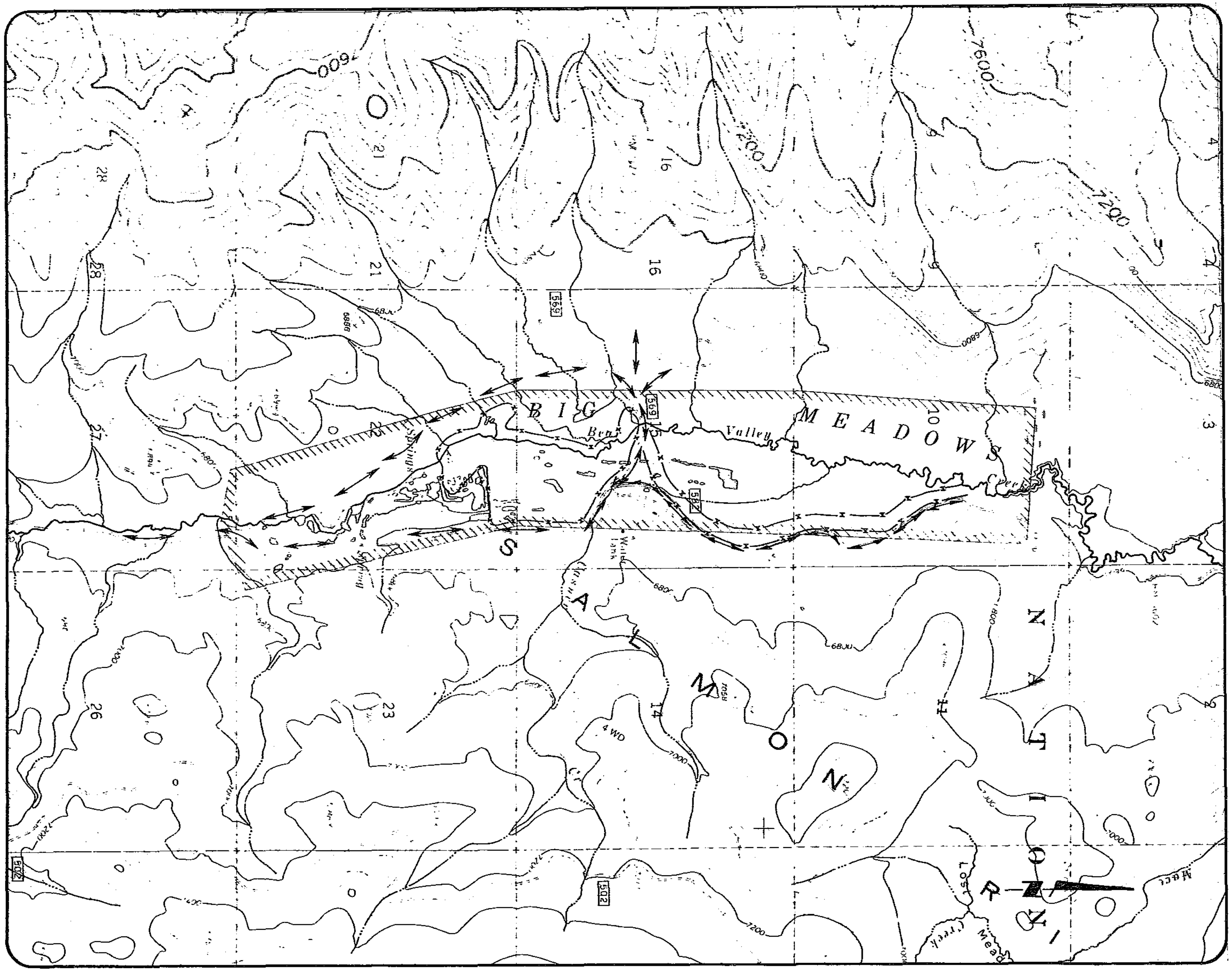
‘The selected alternative and the recommended fence enclosing the improvements will have minor effects on existing livestock operations and access in the Big Meadows area of Bear Valley. The fencing will be located entirely on patented land and enclose areas presently producing limited or no vegetation. The main road through the patented land is sometimes used to drive cattle to and from Big Meadows and the small meadow areas south of the patented land. A secondary livestock access route to the west of Bear Valley Creek is apparent in low level photographs of the area !BPA, 19841. Both of these access routes are shown in Figure 6-1 along with the proposed fencing around the selected alter-

TABLE 6-l

ESTIMATED COSTS FOR FENCING ALTERNATIVES
BEAR VALLEY CREEK FISH HABlTAT ENHANCEMENT PROJECT

Fencing Alternative	unit cost ($1	unit	Estimated cost ($I*
New Zealand Type Electric	1.50	lin ft	20,000
Jackleg	4.00	lin ft	52,000
Post and Pole	4.00	lin ft	52,000
Laydown Barbed Wire	0.75	lin ft	10,000

*Based on total length of 13,000 feet of fencing for the Selected Alternative.



BEAR VALLEY CREEK FISH HABITAT ENHANCEMENT PROJECT

FIGURE 6-1

LIVESTOCK ACCESS ROUTES

LEGEND

PROPOSED FENCING AROUND THE PREFERRED ALTERNATIVE

EXISTING LIVESTOCK ACCESS ROUTES

PATENTED LAND BOUNDARY

0 1000 2000 4000

SCALE FEET

JAMES M. MONTGOMERY, CONSULTING ENGINEERS, INC.

native. One effect of the fencing on livestock will be an exclusion of the animals from the west side of Bear Valley Creek south of the bridge in Section 15.

The selected alternative could have beneficial long term effects on the livestock after the new vegetation becomes estzblished in the stream reaches and adjacent areas. The fencing will probably be left in place for ten years, and then it may be removed depending on the success of the revegetation efforts.

SUMMARY

.

This chapter has described and evaluated four alternatives far fencing around the selected alternative on 'the patented land in Bear Valley, and has provided a recommended fencing alternative which would have only minor effects on current and future livestock access routes and operations. The laydown barbed wire fence is recommended based upon evaluation of: various criteria established for the project. The fence will be maintained foi at least ten years in order to help promote revegetation of the most severly disturbed areas cm the patented land.

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BEAR VALLEY CREEK, IDAHO

FISH HABITAT ENHANCEMENT PROJECT

PREFERRED ALTERNATIVE REPORT

Prepared for

THE SHOSHONB-BANNOCK TRIBES

This project is funded by the Bonneville Power Administration
under Contract Number 83-359,

JUNE, 1985

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713.0044

June 20, 1985

Shoshone-Bannock Tribes
P. 0. Box 306
Fort Hall, ID 83203

Attention: Dr. Richard C. Konopacky, Project Manager

Subject: Bonneville Power Administration Contract No. 83-359
Bear Valley Creek Fish Habitat Enhancement Project

Gentlemen:

We are pleased to submit ten copies of the Preferred Alternative Report for the Bear Valley Creek Fish Habitat Enhancement Project. This report is the output for Contract Amendment No. 5 to our November 15, 1984 contract. At your instruction, copies of this report are being given directly to Bear Valley Minerals, Inc. and Bonneville Power Administration. Additional copies of the report are being produced and will be sent to members of the Interagency Task Force on the attached mailing list at your direction.

James M. Montgomery, Consulting Engineers, Inc. (JMM) wishes to express its appreciation for the constructive review, technical input, and information provided by Dr. Konopacky and Mr. Bowles of the Shoshone-Bannock Tribes. The JMM project team also wishes to express their gratitude'for the patient assistance of Bear Valley Minerals, Inc., the Bonneville Power Administration, the USDA-Forest Service, and Idaho Department of Fish and.Game.

This report presents a description, analysis, and evaluation of the alternative preferred for implementation on the patented land in Bear Valley Creek. It includes chapters discussing implementation and construction considerations, and also presents a livestock access plan. The preferred alternative is a refinement of 1) the alternative selected by the Shoshone-Bannock Tribes and the Interagency Task Force at their meeting held in Boise on April 2, 1985, and 2) the recommended alternative from the Draft Feasibility Report submitted to the Shoshone-Bannock Tribes on March 26, 1985. The preferred alternative also had significant input from Bear Valley Minerals, Inc.

We would like to remind you that the information contained in this report may be subject to modification based on further investigation and verification of field conditions. All written comments on this report should be directed to Dr. Konopacky.

Again, we appreciate all of the assistance and cooperation provided to JMM in conducting this study. We look forward to working with the Shoshone-Barmock Tribes., Bonneville Power Administration, the agencies represented on the Inter-agency Task Force, and Bear Valley Minerals, Inc. in successful implementation of this important project in Bear Valley Creek. If you have any questions, or comments, please call us at (208) 345-5865.

Very truly yours,

E. T. Cryer

Edwin T. Cryer
Project Manager

Brian D. Limkrg

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Attachment

Enclosures

ATTACHMENT

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Comprised of representatives from the following agencies:

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USDA-Intermoun@iq Forest and Range Experience Station
USDI-Fish end Wildlife Service
USDI-Bureau of Land Management
Idaho Department of Fish and Game
Idaho Department of Water Resources

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CHAF'TER 1

SUMMARY

The Preferred Alternative Report provides a detailed description and analysis of the alternative selected for protecting, mitigating and enhancing fish habitat in the Bear Valley Creek study area, and also includes a description and analysis of the stream channel realignment proposed by Bear Valley Minerals, Inc.
2 presents an introduction to the report and includes a statement of the problem, purpose and background, the scope of study for the project, report utilization, and authorization. The preferred alternative is described in Chapter 3, and is comprised of seven components which involve stabilization and revegetation of' three stream reaches and two adjacent areas, and construction of a stream channel realignment on the patented land downstream of the enhancement portion of the project. The implementation considerations for the project are *discussed in* Chapter 4, and they include land ownership, potential conflicts with existing and future use of the patented land, and the permit requirements and acquision. There are a total of ten permits, approvals, or actions required for implementation of the enhancement portion of the preferred alternative. Chapter 5 provides a discussion on construction considerations including estimated construction quantities, preliminary cost estimates, phasing of construction, and construction scheduling. The cost estimate prepared for the preferred alternative is considered a feasibility level estimate with an accuracy of plus 50 percent and minus 30 percent. The total preliminary estimated cost for the enhancement portion of the preferred alternative is approximately $2,153,000 (mid-1985 dollars), and construction will be phased over several years.. The total preliminary estimated cost for the stream channel realignment portion of the preferred alternative is approximately $5,682,000 (mid-1985 dollars). Chapter 6 presents the livestock access plan which describes and evaluates four alternative types of fencing, livestock crossings, and the effects of the preferred alternative on the existing livestock operations.

CHAPTER 2

INTRODUCTION

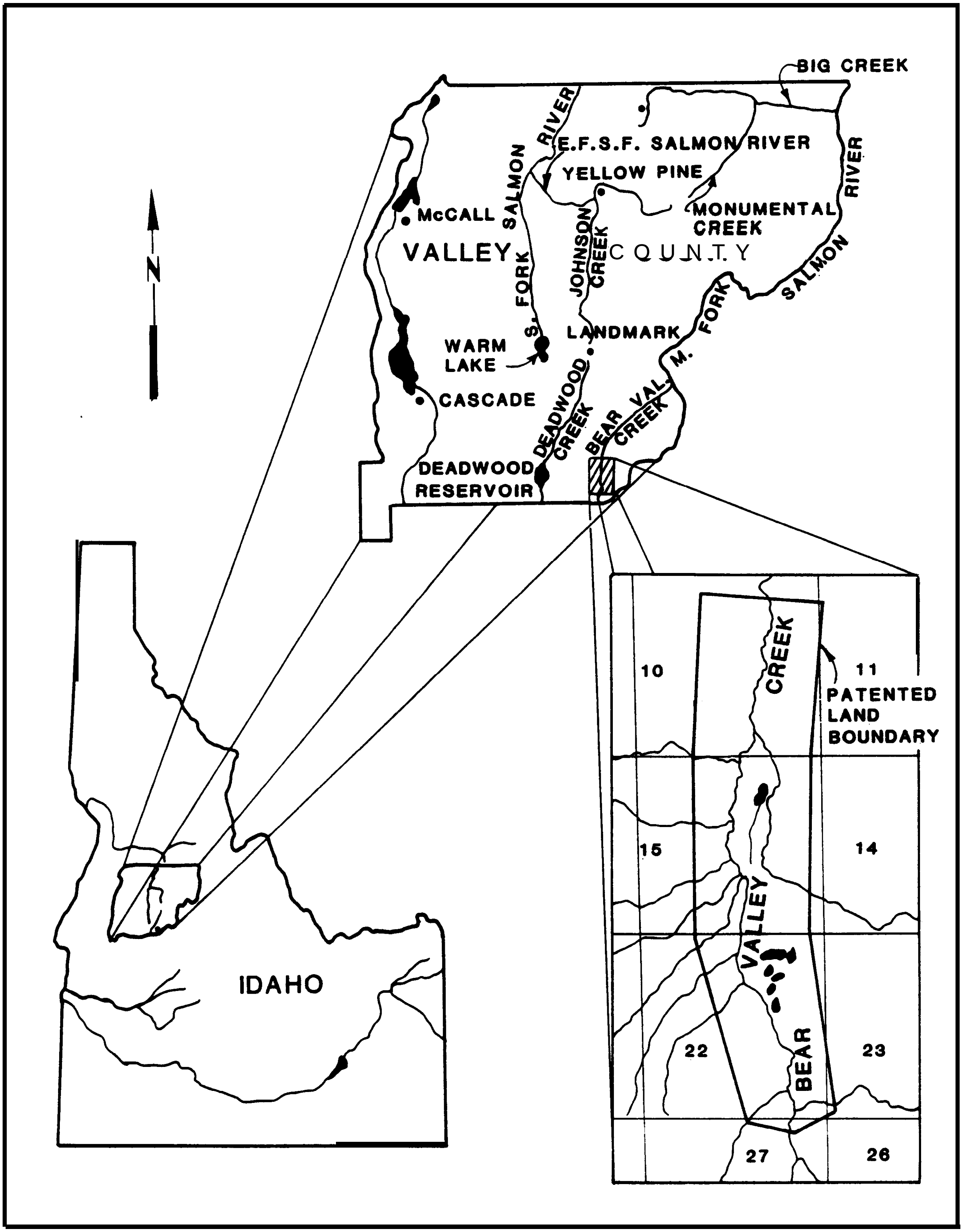
STATEMENT OF PROBLEM

The past thirty years have shown a significant decline in the return of chinook salmon and steelhead to their natural spawning areas in Idaho. There are several significant reasons for the loss of this important resource, including the dams on the lower Columbia and Snake and Clearwater Rivers, increased fishing pressures by commerical, sport and subsistence fishermen, reduced flows during critical migration periods, water quality problems, and the continuing destruction of spawning and rearing habitat by natural and human accelerated modification of stream channels and bed substratum. Numerous studies and reports have attempted to quantitatively and qualitatively assess the impacts of the various reported reasons for the observed decline in natural anadromous fish spawning. This document is limited to one specific aspect of the overall problem. The problem addressed by this report is the stabilization and rehabilitation of one area of sediment production, believed to be affecting extended areas of downstream spawning and rearing habitat. This problem area is the privately held, previously mined lands in the Big Meadows area of the Bear Valley Creek drainage (Figure 2-l). The project study area includes portions of Sections 10, 15, and 22, Township 11 North, Range 8 East, Boise Meridian. It has been estimated that during the past 11 years, at least 11,000 cubic yards of fine, decomposed granitic material has been eroded from approximately two miles of stream bank and areas adjacent to the stream within the study area. Bear Valley Creek was diverted into its present stream channel through the mined area in 1969 and an estimated 500,000 cubic yards of material have been eroded and transported downstream. This material has subsequently been redeposited in the downstream headwaters of the Middle Fork of the Salmon River, which includes a significant portion of the historical spawning areas on the Salmon River drainage. Areas of Bear Valley Creek have historically provided very important chinook salmon spawning and rearing habitat. Chinook salmon redd counts in Bear Valley Creek prior to the 1950's ranged from an estimated 600 to 1200 during each year. The 1984 chinook salmon redd counts were estimated at 60 for Bear Valley Creek (Konopacky, personal communication, 1985). The decrease of chinook salmon redds in Bear Valley Creek over time has led to identification of the need for preserving the diversity of the gene pool of these wild fish.

The Draft Bear Valley Creek, Idaho, Fish Habitat Enhancement Project Feasibility Report (JMM, 1985) identified the problem erosion and sedimentatior areas, and provided an analysis and evaluation of alternatives for eliminating or ameliorating the problems within the patented land of the Bear Valley Creek drainage. This report provides a description and analysis of the alternative proposed for implementation on the patented land.

PURPOSE AND BACKGROUND

The purpose of this report is to provide the Shoshone-Bannock Tribes (Tribes) with a detailed description of the preferred alternative that will permit con-



BEAR VALLEY CREEK
FISH HABITAT ENHANCEMENT PROJECT
LOCATION MAP
FIGURE 2-1

struction of enhancement and mitigation measures in order to protect existing spawning and rearing habitat areas presently undergoing degradation. The Bear Valley Creek Habitat Restoration project has been undertaken in conjunction with other concurrent studies and those yet to be performed, that fall under the Salmon River Habitat Enhancement Program funded by the Bonneville Power Administration (BPA). This program provides offsite enhancement as partial compensation for fish habitat damage and migration problems related to hydro-electric power projects in the Columbia River Basin. These other studies will evaluate the feasibility of making improvements on the public lands in Bear Valley Creek in order to protect downstream habitat and provide mitigation measures for the area in question. The project is listed in program measure 704.(d)(1), Table 2 of the Northwest Power Planning Council's 1984 Columbia River Basin Fish and Wildlife Program.

The Tribes are sponsoring this project because the Middle Fork of the Salmon River drainage is part of their traditional subsistence fishing ground, as provided in the Treaty with the Eastern Band Shoshoni and Bannock, 1868 and its amend-ments. The Tribes have invested significant manpower and resources into various studies and management programs for the protection and enhancement of anadromous fish in the Salmon River drainage. The Bear Valley Creek Fish Habitat Enhancement Project is one of the primary habitat protection efforts undertaken by the Tribes.

During the period from 1954 to 1959 the presently patented (privately owned) land (Figure 2-1) in Big Meadows of the Bear Valley Creek drainage was dredge mined for the strategic mineral columbite and euxenite. The past mining oper-ation incorporated reclamation methods appropriate to the technology of the times, however, the site has increasingly become a chronic problem area as a result of these earlier activities. During the past 25 years, the stream has eroded the dredge tailing and undisturbed placer material vertically and horizon-tally, resulting in the generation of substantial quantities of sediment which subsequently were transported to downstream reaches. The sedimentation has contributed to a reduction of spawning and other critical habitat areas for chinook salmon. The overall purpose of the project, as described in the Project Work Plan (JMM, 1984), is for the Bear Valley Creek Habitat Restoration Pro-gram to develop and implement alternatives which will reduce the erosion and sedimentation and enhance the fish habitat.

The preferred alternative includes a stream channel realignment component which would divert the flow of Bear Valley Creek from a point upstream of the bridge in Section 15 to the north end of the patented land. The stream channel realaignment would be constructed as part of any potential future mining activity on the patented land. The preferred alternative, comprised of the stream chan-nel enhancement and the realignment, was developed in conjunction with Bear Valley Minerals, Inc., owner of the patented land on Bear Valley Creek. The purpose of the preferred alternative is to provide for fish habitat enhancement and potential future mining in an environmentally sound manner on the patented land.

SCOPE OF STUDY

This report presents a detailed description and analysis of the preferred alternative for the patented land in Bear Valley. The enhancement portion of the preferred alternative was described in the Draft Feasibility Report (JMM, 1985) as one of four project alternatives formulated to meet the objectives of the project. The Draft Feasibility Report was written and developed from a technical approach presented in the Project Work Plan (JMM, 1984). Brief discussions of the Project Work Plan and Draft Feasibility Report are included below.

Project Work Plan

The Project Work Plan (JMM, 1984) was prepared in part as a guide for 1) documenting the erosion and sedimentation problems in the study area; and 2) evaluating alternatives necessary to control the problems and improve fish habitat conditions. JMM identified **a** number of tasks for the feasibility study in the Technical Approach section of the Project Work Plan. The results of the initial tasks were presented to the Shoshone-Bannock Tribes and the Interagency Task Force in a series of ten separate technical memoranda. The technical memoranda were used to prepare portions of the Draft Feasibility Report (JMM, 19851, which was the primary output of the last work task in the Project Work Plan. Copies of the Project Work Plan were submitted to the Shoshone-Bannock Tribes and members of the Interagency Task Force for comment in November 1984.

Draft Feasibility Report

The Draft Feasibility Report (JMM, 1985) was prepared to document 1) the results of a data and literature search, 2) the data analysis of physical characteristics and erosion problems in the study area, 3) the procedure used to formulate and develop alternative components, and 4) the analysis and evaluation of project alternatives using engineering and environmental criteria. The Draft Feasibility Report identified a recommended alternative for implementation within the patented land in Bear Valley. A refinement of the recommended alternative is presented as part of the preferred alternative in this report.

Data and Literature Search. The data and literature search resulted in a compilation of information about past studies in Bear Valley and related analogous studies in similar areas. The information and data collected on Bear Valley was primarily qualitative, but sufficient to complete the feasibility study within the stated assumptions. The literature compiled for the project includes reports, articles, and other information on similar projects which **was** used in the development of alternatives. Some of the literature on stream habitat enhancement, riparian revegetation, and bank restoration is referenced in this report.

Characterization of the Study Area and Problem Identification. The physical characteristics and erosion problems of the study area were analyzed using the data and information collected on Bear Valley. Surface water hydrology was analyzed using a computer model to estimate a design event streamflow. The 1974 snowmelt runoff was determined to be an appropriate design event, yielding an estimated peak flow of 616 cfs from the study area and its tributary watershed. 'Groundwater flows of 20 to 3'0"cfs Were estimated from the limited stream gauging data, The plants in the study area were characterized in terms of four vegetation types. Erosion and sedimenttion rates were estimated from USDA-Forest Service (USFS) cross section data. Soils were described in terms of three main landtype associations recognized by the USFS. Geology and mineral resources were characterized from various government agency reports and information provided by Bear Valley Minerals, Inc. Upon completion of these and other data analyses, the study area was systematically divided into stream reaches and adjacent areas according to severity of erosion and associated problems using a set of evaluation criteria. The problem stream reaches and adjacent areas were then ranked and assigned a priority for development of preliminary alternatives.

Preliminary Alternative Development. The preliminary alternatives were formulated and analyzed using a procedure incorporating the objectives of the project. Alternative components developed for the study area ranged from diversion of the stream around the mined area. to statbilization of the stream channel in its existing alignments. The alternative components were then screened based on relative construction cost, engmeering feasibility and constructability, implementation requirements, reliability; and effectiveness. The screening procedure resulted in identification of four project alternatives which would each provide an overall solution to the identified problems within the study area. The "no action alternative" was briefly discussed and not considered furtlier because it would not meet the project objectives.

Analysis and Evaluation of Project Alternatives. The project alternatives were described by component and thebn evalusted using engineering and environmental criteria. These criteria included:

- Engineering Feasibility and constructability
- Reliability and Effectiveness
- Implement&ion Considerations
- Environmental Effects
- Preliminary Cost Estimates

The project alternatives, including the recommended alternative, are briefly described below.

Project Alternative I. Project Alternative I would involve constructing a 15,600 foot diversion channel throughout the length of the patented land in Bear Valley. The objectives of this alternative are to divert Bear Valley Creek around all of the problem stream reaches through a stabilized channel with constructed floodplain 'and revegetate 'two problem adjacent areas. There are four primary components comprising Project Alternative I including the main diversion channel, a west side drainage channel, and stabilization of the two problem adjacent areas. The total preliminary cost estimate of Project Alternative I is approximately $18.6 million (March 1985 dollars).

Project Alterntive II: Project Alternative II involves constructing a 9,200 foot diversion Channel through a portion fo the patented land in Bear Valley. The onjectives of this alternative are to divert Bear Valley Creek around three problem stream reaches through a stabilized channel with constructed floodplain, stabilize/revegetate two problem stream reaches, and stabilize/revegetate two problem adjacent areas. There are six primary components comprising, Project Alternative II including the main diver&n channel, a west side drainage channel,, and stabilizing the two problem stream reaches and two problem adjacent areas: The total preliminary cost estimate of Project Alternative If is approximately $11.9 million (March 1985 dollars).

Project Alternative II. Project Alternative III would involve constructing a 12,800 foot diversion channel through a portion of the patented land in Bear Valley. The objectives of this alternative are to divert Bear Valley Creek around five problem stream reaches through a stabilized channel with constructed Floodplain, and stabilize/revegetate two problem adjacent areas. There are four primary components comprising Project Alternative II including the main diversion channel, a west side drainage channel, and stabilization of the two problem adjacent areas. The total preliminary cost estimate of Project Alternative III is approximately $14.8 million (March 1985 dollars).

Project Alternative IV. Project Alternative IV would involve constructing, a 2,200 foot diversion channel around one problem stream reach and stabilizing the existing Bear Valley Creek channel through other,, selected areas of the patented land. The objectives of this alternative are to divert Bear Valley Creek around one problem stream reach, stabilize/revegetate four Problem stream reaches in the existing channel, and stabilize/revegetate two problem adjacent areas. There are seven primary components comprising project Alternative IV. The total preliminary cost estimate of Project Alternative IV is Approximately 53.8 million (March 1985 dollars).

The project alternatives were evalustd ijn terms of the criteria listed earlier *and* rated using a point system. The ratings are shown in Table Z-I, and Project Alternative IV is rated the highest through this evaluation process. Project Alternative IV is the recommended alternative, and is refined and described, in the remaining chapters of this report as the enhancement portion of the preferred alternative. The Selected Alternative Report *(JMMj,* 1985) was expanded to include a stream channel realignment as part of the preferred alternative ***at*** the request of Bear Valley Minerals, Inc. A complete description of the procedure used in development, analysis, and evaluation of the alternatives as discussed above may be found in the Draft Feasibility Report ***(JMM,*** 1985).

REPORT UTILIZATION

This report considers the Prliminary feasibility of controlling and reducing erosion and sedimentation arising from the patented land in the Bear Valley Creek,drainage with an overall objective to enhance fish habitat, Although. care has been taken, to assure the reliability of the information set forth in this report, the site specific research has not been as exhaustive as originally proposed, due to the inability to conduct additional field studies in 1984 because of the onset of winter. Data and factual information obtained from third parties have not been independently verified. The timing of the study has not permitted

TABLE 2-1

SUMMARY RATING OF THE PROJECT ALTERNATIVES

Project Alternative	Engineering Feasibility and Constructability (1-5)	Reliability and Effectiveness (1-5)	Implementation Considerations (1-5)	Environmental Effects (1-5)	Preliminary Cost Estimates (1-5)	Total Point Rating (5-25)
I	1	2	3	3	1	10
II	2	2	3	3	2	12
III	2	2	3	3	1	11
IV	4	5	3	5	4	21

Point Rating Key:

1 - Poor
2 - Fair
3 - Moderate
4 - Good
5 - Excellent

any assessment of the reliability of data obtained during the course of the study or at other specific times. Therefore, for these and other reasons, the possibility of error or misinterpretation of information supplied by third parties connot be entirely ruled out, though care has been taken to assure the greatest reliability possible under the circumstances. Nevertheless, all findings, conclusions, data, and information expressed in this report should be regarded as preliminary and subject to further refinement and development, when the design of the selected modifications is actually undertaken.

As currently envisioned, additional field verification will be conducted in spring and summer 1985 with all necessary design support studies finalized by July/August 1985. Initial design of the enhancement portion of the preferred alternative will be completed during the calendar year 1985. Construction of the project components will be phased over several summer and fall construction seasons. Final estimated cost, implementation plans, permitting activities and construction management activities will be addressed during the design phase.

AUTHORIZATION

The Bear Valley Creek, Idaho, Fish Habitat Enhanwment Project is being performed by James M. Montgomery, Consulting Engineers,, Inc. (JMM) for the Shoshone-Bannock Tribes, under Bonneville Power Administration (BPA) contract number 83-359. The project is-funded by BPA's Divisign of Fish and Wildlige as part of the overall effort to protect, mitigate, and enhance fish habitat and resources impacted by hydroelectric development and operation in the Coliumbia River Basin. Bear Valley Minerals, Inc. has granted an easement to, fhe Tribes for conducting the feasibility study on the patented land in Bear Valley,

ABBREVIATIONS

In order to conserve space and improve readability, the following abbreviations have been used throughout this report:

BLM...........	Bureau of Land Management
BPA...........	Bonneville Power Administration
cfs.............	cubic feet per second
COE...........	U.S. Army Corps of Engineers
cu yd..........	cubic yard
cu yd/yr.......	cubic yard per year
cu ft...........	cubic feet
USFS..........	USDA-Forest Service
ft...............	foot (feet)
fps.............	feet per second
USFWS........	USDI-F&h and 'Wildlife Service
HEC...........	Hydrologic Engineering Center
IDFG..........	Idaho Department of Fish and Game .
IDWR.	Idaho Department of Water Resources
JMM...........	James M. Montgomery, Consulting Engineers, Inc.
lin ft..........	linear foot (feet)
sq mi..........	square mile(s)

mg/l...	milligram(s) par liter
mm............	millimeter
MSL............	mean sea level
scs.............	USDA - Soil Conservation Service
sq ft.	square feet
sq yd...........	square yard
tons/sq mi/yr	tons per square mile per year
tons/yr.	tons per year
Tribes..........	The Shoshone-Bannock Tribes
USGS...........	USDI - Geological Survey
yr................	year

CHAPTER 3'

DESCRIPTION OF THE PREFERRED ALTERNATIVE

INTRODUCITON

This chapter provides a detailed description of the Bear Valley Creek Fish Habitat Enhancement Project preferred alternative by its individual components. Each component corresponds to an identified problem stream reach or adjacent area on the patented land, as presented in the Draft Feasibility Report (JMM, 1985). In, addition, a stream channel realignment is proposed for Bear Valley Creek on the patented land as part of the preferred alternative. The preferred alternative is comprised of seven components, including stabilization and re= vegetation of three stream reaches and two adjacent areas, the stream channel realignment, and minor components. The minor components consist of re-vegetating small, isolated disturbed areas and fencing around enhancement areas on the patented land.

Two additional stream reaches were identified as part of the recommended alternative in the Draft Feasibility Report (JMM, 1985), Stream reaches B and I will be *given further consideration* when site access is possible, but are not discussed in detail in this report. These two problem stream reaches will receive further study during the, 1985 field season to determine the extent of the problems and the need for stabilization and revegetation. Recommendations for *stream* reaches B and I will be made in a technical memorandum to be prepared following a late June 1985 field session in Bear Valley with the Interagency Task Force.

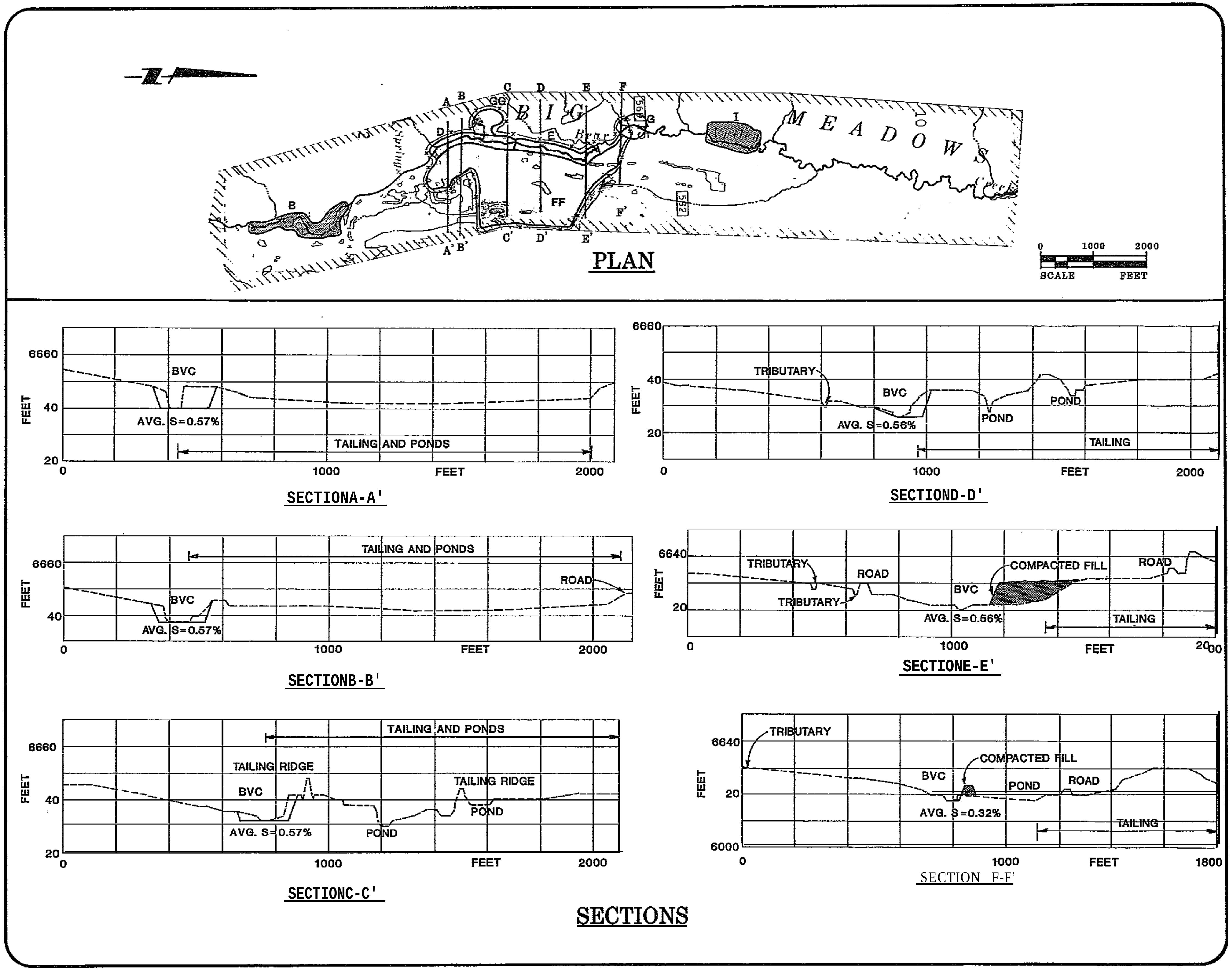
A summary analysis of the preferred alternative is presented **at** the end of this chapter and includes an explanation of the recommended construction treatments and a brief discussion of the project objectives in terms of the preferred alternative. It is important to remember that the overall goal of the preferred alternative is to enhance fish habitat in Bear Valley Creek.

DESCRIPION OF THE PREFERRED ALTERNATIVE COMPONENTS

The preferred alternative components are described below in terms of location; proposed modifications, design streamflow, stream velocity, stream channel width, constructed floodplain features, riparian vegetation and stabilization, and. other characteristics, as applicable. The discussion is focused on the stabilization and revegetation of stream reaches D, E, and G, revegetation of adjacent areas GG and FF, the stream channel realignment, and minor components, as shown in Figures 3-l and 3-9. Schematic drawings of the enhancement measures are included to help describe the preferred alternative components.

Stabilization and Revegetation of Stream Reach D

The stabilization and revegetation of *stream* reach D will be located as shown on Figure 3-l. The primary objectives of this component of the preferred alterna-



BEAR VALLEY CREEK FISH HABITAT ENHANCEMENT PROJECT

FIGURE 3-1

SELECTED ALTERNATIVE

LEGEND

PLAN

PATENTED LAND BOUNDARY

D — STABILIZATION AND REVEGETATION OF STREAM REACHES

GG — STABILIZATION AND REVEGETATION OF ADJACENT AREAS

I — STREAM REACHES TO RECEIVE FURTHER STUDY IN THE FIELD

E–E' — CROSS SECTION LOCATION8

PROPOSED FENCING

SECTIONS

PROPOSED CONSTRUCTED FLOODPLAIN

EXISTING CROSS EJECTIONS

AVG. S — AVERAGE SLOPE

BVC — BEAB "ALLEY CREEK

COMPACTED FILL

NOTE: ALL CHANNEL SIDE SLOPES ARE 3:1. CROSS SECTION SCALE IS 10 TO 1 VERTICAL EXAGGERATION.

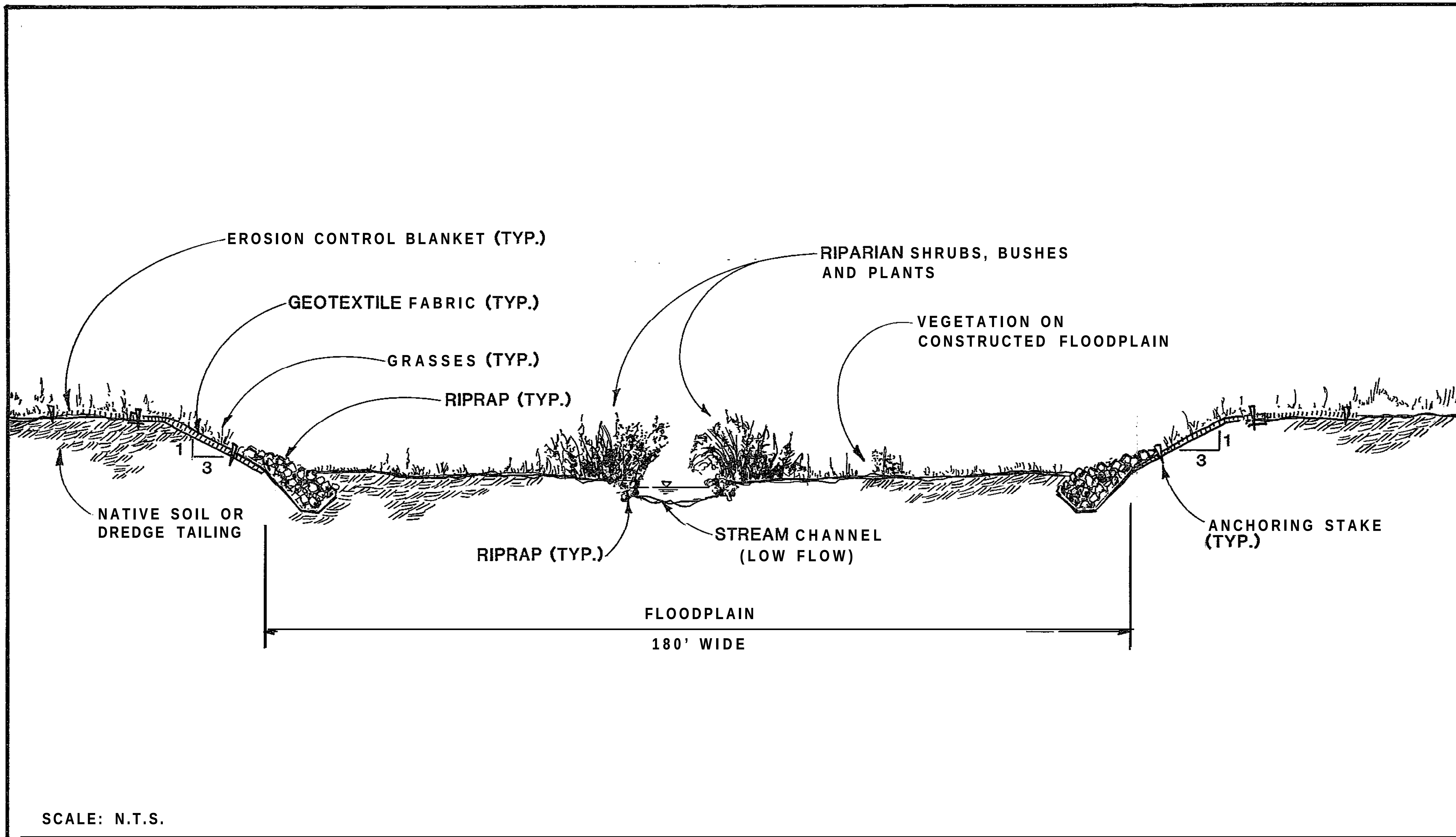
JAMES M. MONTGOMERY, CONSULTING ENGINEERS, INC.

tive are to stabilize and revegetate both stream banks and the floodplain of stream reach D. The improvements will be made over a total distance of approximately 1500 feet. A schematic section typical of the improvements is shown in Figure 3-2.

The existing nearly vertical banks along the stream will be excavated back tc provide a floodplain for stream meandering and snowmelt runoff flood flows. Cross sections of the constructed floodplain are shown in Figure 3-1. The floodplain will be constructed to provide capacity for the estimated design peak runoff of approximately 250 cfs. The floodplain will be 180 feet wide as determined by the approximate width of the stream meander belt in Rig Meadows prior tc the mining activity. The proposed floodplain width is subject to modification during design of the improvements which will include analysis of the backwater curve using the HEC-2 computer model. The design peak flow would have an average depth of approximateIy 0.8 feet in the constructed floodplain and a velocity ranging from 1.7 to 2.0 fps. The constructed floodplain is schematically shown in Figure 3-2.

The banks defining the limits of the constructed floodplain will be sloped 3 to 1 and stabilized with a combination of specialized geotextile fabric, erosion control blanket, vegetation, and riprap. The geotextile fabric under consideration has designed openings that provide for vegetative growth. The erosion contro1 blanket is a natural wood fiber mat which helps promote vegetative growth by retaining soil moisture, controlling soil surface temperature fluctuations, and stabilizing disturbed soil surfaces. The side slopes will first be broadcast seeded with an appropriate mixture of grass seeds to encourage revegetation. Soil nutrient requirements and fertilization rates will be determined following completion of field studies. The erosion control blanket will be installed over the seeded slopes. The geotextile fabric will then be instaled over the lower portion of the erosion control mat as shown in Figure 3-2. The riprap will be placed on top of the geotextile fabric at the toe of the side slopes and keyed into the constructed floodplain to a depth of at least two feet below the invert of the stream channel. This will help prevent the stream from continuing a meander into the stabilized floodplain bank. The riprap will have an average diameter of 10 inches and a maximum diameter of 15 inches. The riprap will extend up the sIope to a height of one foot above the design peak flow water surface. The overall stabilization of the floodplain banks will be applied to both sides of the floodplain, as shown in Figure 3-2.

The existing low flow stream channel will be left undisturbed in its present alignment. The stream channel banks will be stabilized with riprap and revegetated with riparian plants to promote establishment of root mats and small overhangs which provide cover habitat for fish. The riprap will be placed along the stream where necessary to help build and stabilize banks. Riparian shrubs, bushes, and other plants or cuttings will be planted along the banks in the wet zone as discussed by Claire and Scherzinger (19781, and Claire (1980), The constructed floodplain will be planted with shrubs and grasses adapted to growing in capillary zone conditions (Claire and Scherzinger, 19781. Erosion control blankets will be used in some portions of the constructed floodplain to help promote the revegetation effort. SoiI nutrient requirements and fertilizer ap-



SCHEMATIC SECTION OF STREAMBANK STABILIZATION AND CONSTRUCTED FLOODPLAIN IN REACH D

FIGURE 3-2

plication rates will be determined following completion of field studies. The' establishment of vegetation in the constructed floodplain will help stabilize the soil surface and return the floodplain to conditions, like those in downstream areas generally undisturbed by the past mining activity. The streambank and floodplain stabilization and revegetation for reach D are schematically shown in Figure 3-2.

The stabilization and revegetation of reach D will require considerable excavation and construction activity. The floodplain construction will generate an estimated 44,000 cubic yards of excess fill material, which will be used to fill, a portion of reach F (Figure 3-l) and selected sites within adjacent area FF. A' schematic plan of the stabilization and revegetation of reach D is shown in Figure 3-3. A complete balanced cut and fill plan will be prepared as part of the design phase of the enhancement project.

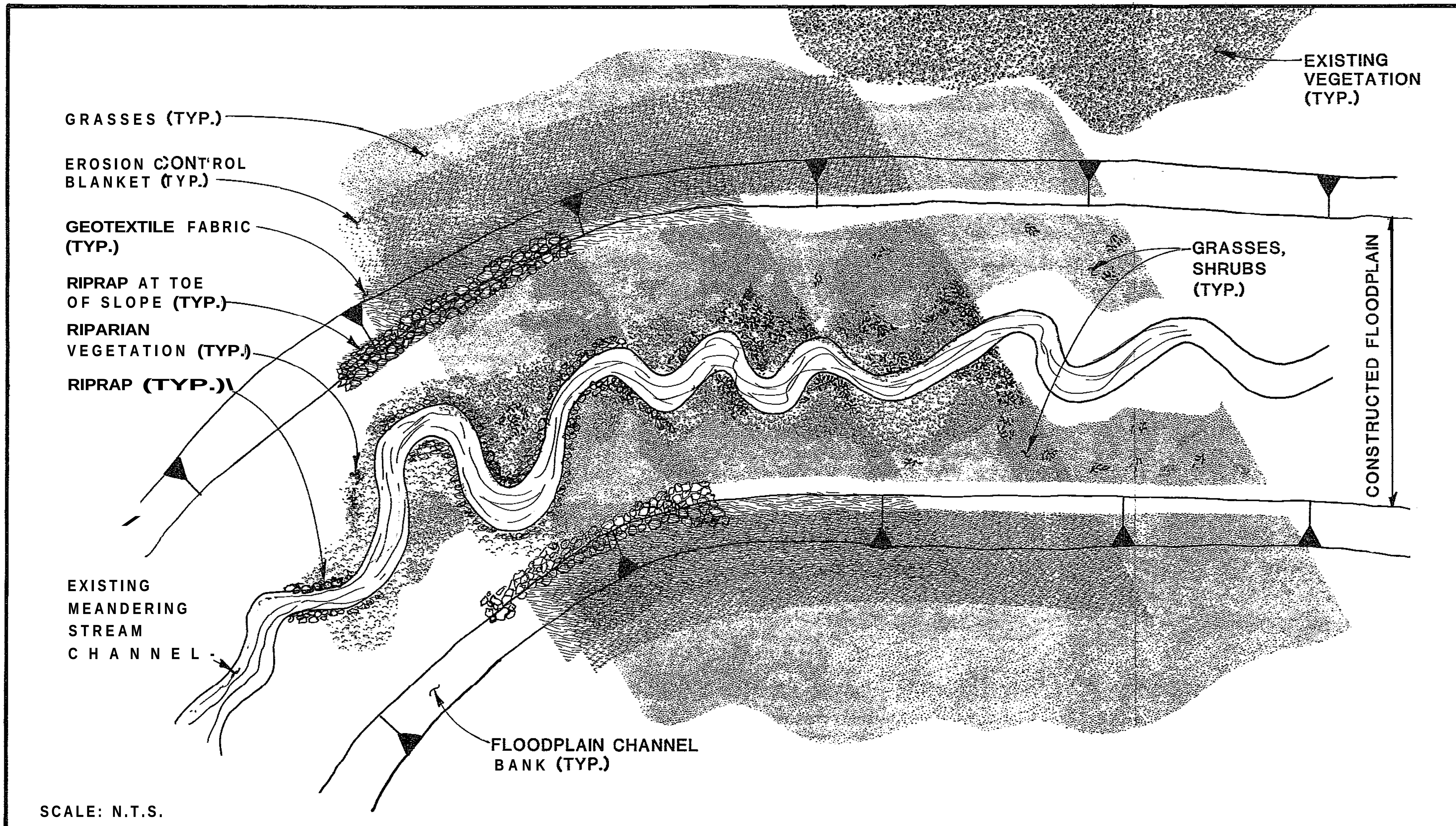
Stabilization and Revegetation of Stream Reach E

The StabiIization and revegetation of stream reach E will be located as shown on Figure 3-l. The primary objectives of this component of the preferred alternative are to stabilize the east streambank through. construction of a floodplain and revegetate both streambanks in reach E. The improvements will be made over' a total distance of approximately 1900 feet, including 200 feet of reach F. The stabilization of stream reach E will be similar to the description provided for. stream reach D, however, only the east bank will be excavated to provide a constructed floodplain. A schematic section typical of the improvements is shown in Figure 3-4.

The existing nearly vertical east bank along the stream will be excavated back to. increase the floodplain for stream meandering and snowmelt runoff flood flows. Cross sections of the constructed floodplain are shown in Figure 3-l. The floodplain will be constructed to provide capacity for the estimated design peak runoff flow of approximately 270 cfs. The floodplain will be 180 feet wide as determined by the approximate width of the stream meander belt in Big Meadows prior to the mining activity. The proposed floodplain width may be modified during design of the improvements and after further hydraulic analysis of the backwater curve using the HEC-2 computer model. The design peak flow would have and average depth of approximately 0.85 feet in the constructed floodplain and a velocity ranging from 1.8 to 2.0 fps. The constructed floodplain section is schematically shown in Figure 3-4.

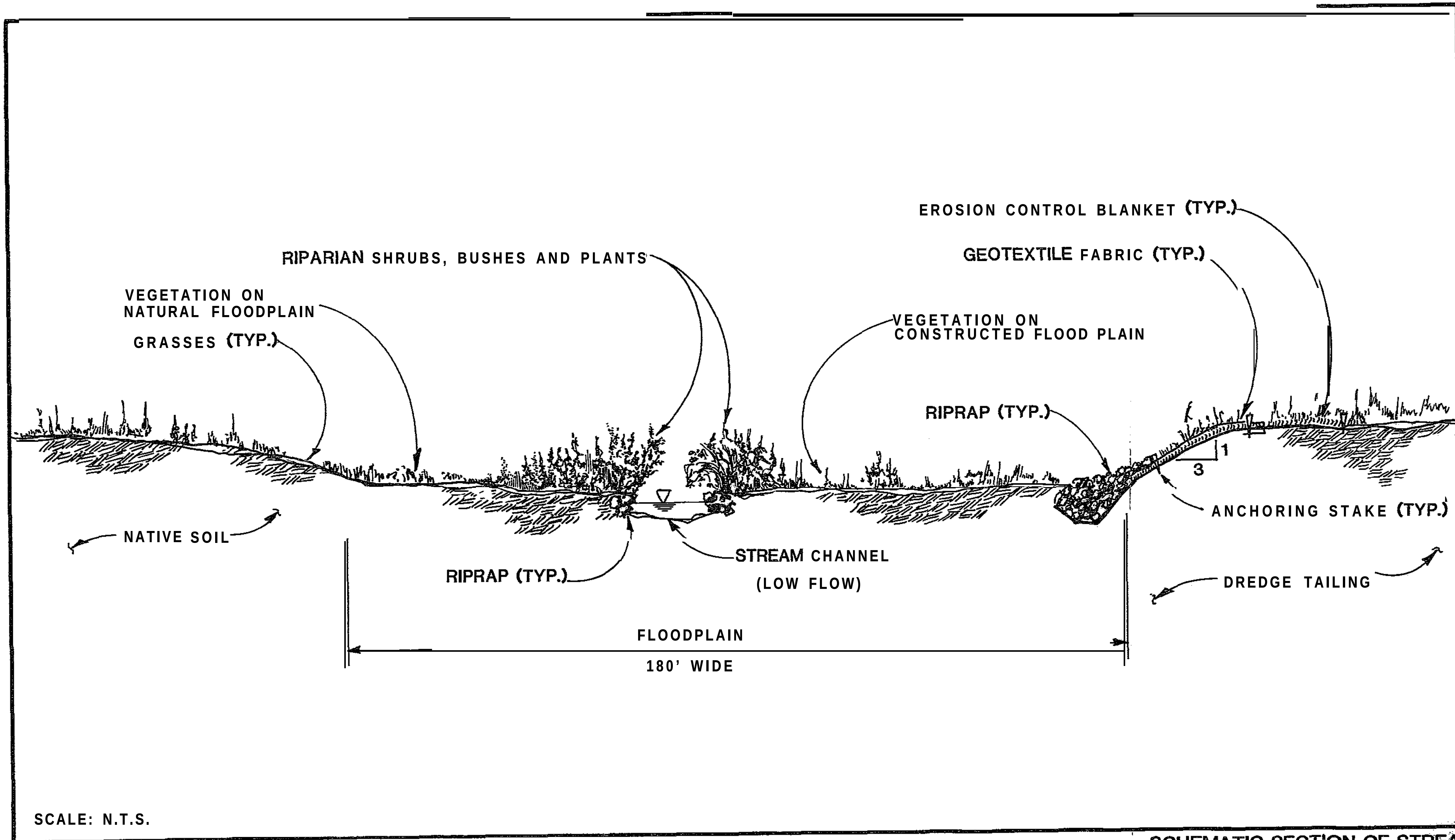
The east bank defining the limits of the constructed floodplain will be sloped 3 to 1 and stabilized with a combination of specialized geoteatile fabric, erosion control blanket, vegetation, and riprap, as discussed previously in the section describing improvements to stream reach D. The west bank of the floodplain through reach E will be revegetated with riparian shrubs, bushes, and other plants as necessary. The overall stabilization of the floodplain banks will be applied as shown in Figure 3-4.

The existing stream channel will be left undisturbed in its present alignment. The stream channel banks will be stabilized with riprap and revegetated with



SCHEMATIC PLAN OF STREAMBANK STABILIZATION AND CONSTRUCTED FLOODPLAIN IN REACH D

FIGURE 3-3



SCHEMATIC SECTION OF STREAMBANK STABILIZATION AND CONSTRUCTED FLOODPLAIN IN REACH E

FIGURE 3-4

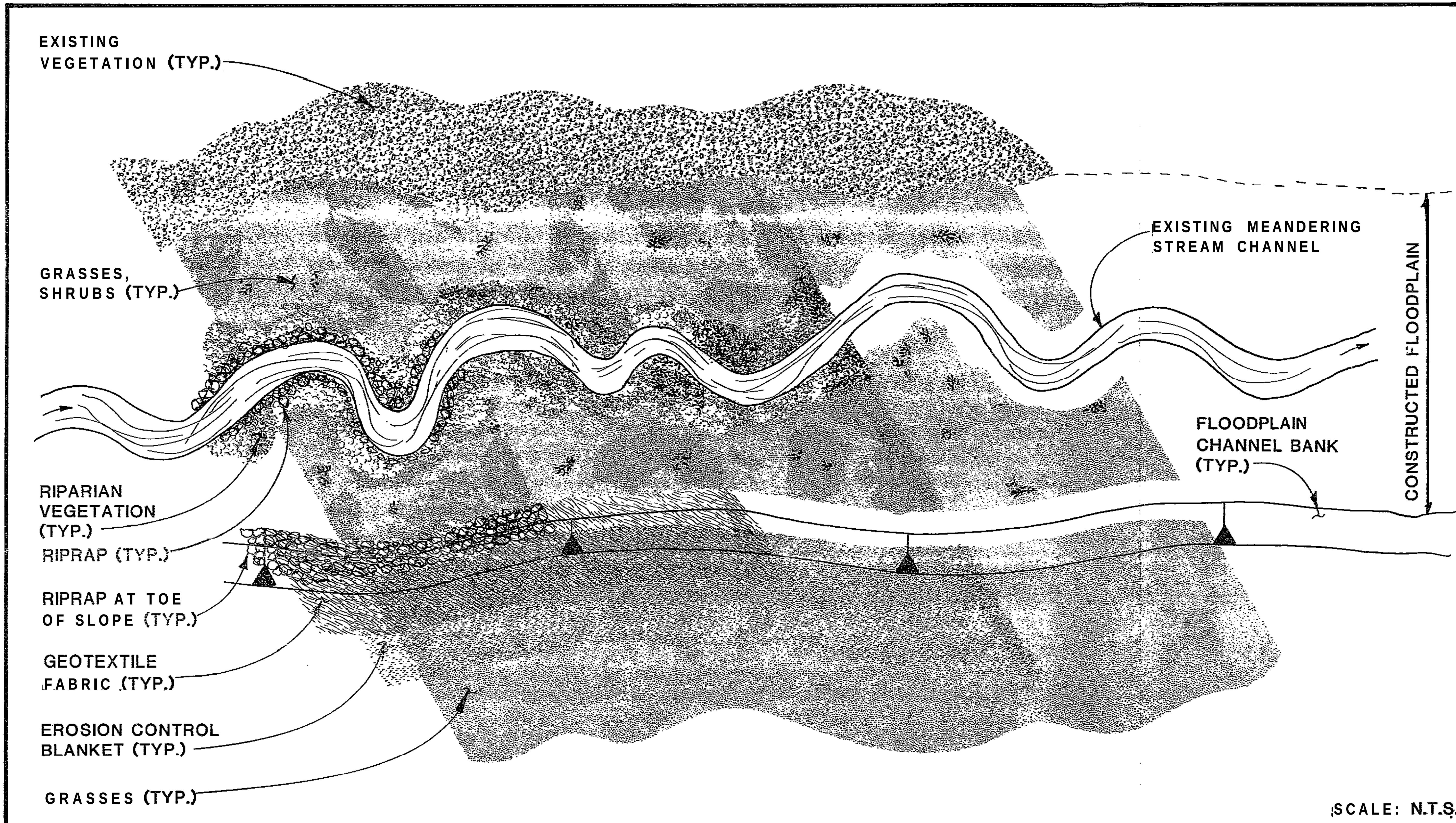
riparian plants to promote encroachment of the vegetation on the stream channel, as described earlier in the discussion of improvements to stream reach D. The constructed floodplain in reach E also will be stabilized and revegetated as described earlier for reach D. The streambank and constructed floodplain stabilization and revegetation for reach E are schematically shown in Figure 3-4.

The stabilization and revegetation of reach E will require substantial excavation and construction activity. The floodplain construction in reach E will generate an estimated 30,000 cubic yards of excess fill material. This excess material will be used to fill a portion of reach F (Figure 3-l) and selected sites within adjacent area FF. Approximately 200 feet of floodplain channel side slope stabilization in the filled portion of reach F is included in the 1900 feet of improvements selected for reach E. A schematic of the stabilization and revegetation of reach E is shown in Figure 3-5.

Stabilization and Revegetation of Stream Reach G

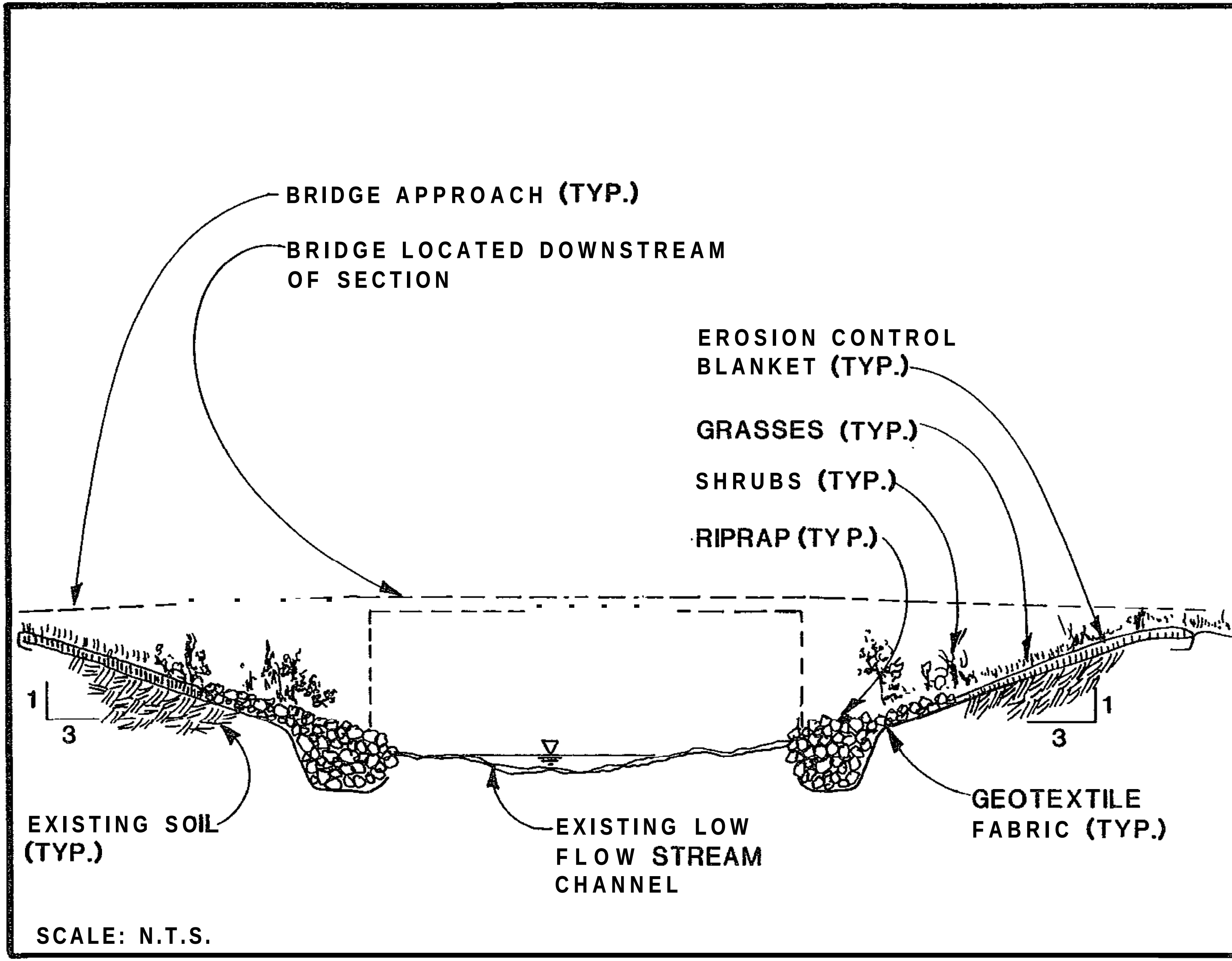
The stabilization and revegetation of stream reach G will be located at the bridge crossing in Section 15 as shown on Figure 3-l. The primary objectives of this component of the preferred alternative are to stabilize both streambanks above and below the bridge through excavation and revegetation where necessary in reach G. The improvements will be made over a total distance of 600 feet along the stream and include revegetation of approximately one acre adjacent to the stream. The design of these improvements will be initiated following completion of field studies to help determine the hydraulic capacity of the bridge and the flood backwater curve. The design will include an analysis of the backwater curve using the HEC-2 computer model to determine if the bridge constricts streamflow or if the area downstream of the bridge is flooding and causing upstream areas to flood. The upstream and downstream channel widths estimated below are subject to modification during design of the improvements. The stabilization and revegetation of the streambanks in reach G will be similar to the description provided for reach D, however, a constructed floodplain will not be incorporated into the improvements because of the bridge width, A schematic section typical of the improvements is shown in Figure 3-b.

The unstable banks in reach G will be excavated back at a 3 to 1 slope. The existing channel at low flow has a width of approximately 20 feet. The improvements will include widening the existing channel to 30 feet and provide adequate capacity for the estimated design peak runoff flow of approximately 328 cfs. The design peak flow would have a depth of approximately 3.0 feet and a velocity of 3.0 fps. The freeboard required for this flow depth and velocity would increase the total streambank height to six feet above the invert of the channel. The 3 to 1 side slopes will be stabilized with specialized geotextile fabric, erosion control blankets, vegetation, and riprap, as discussed earlier in the section describing improvements to stream reach D. The size of riprap used in reach G will have an average diameter of 12 inches and a maximum diameter of 18 inches. The riprap will extend up the side slopes to a height of one foot above the design peak flow water surface. Vegetation used in the bank stabilization efforts will include ripaian bushes, shrubs, and other plants selected for the site. The overall stabilization of the streambanks along reach G will be accomplished as shown in Figure 3-6.



SCHEMATIC PLAN OF STREAMBANK STABILIZATION AND CONSTRUCTED FLOODPLAIN IN REACH E

FIGURE 3 - 5



SCHEMATIC SECTION OF STREAMBANK STABILIZATION AND REVEGETATION IN REACH G

FIGURE 3-6

The stabilization and revegetation of reach G will require some excavation and other construction activity. The bank excavation will require moving approximately 6000 cubic yards of earth, and filling and compacting some of the excess material along the banks to provide the necessary freeboard through reach G. The disturbed area adjacent to the stream will be recontoured as necessary, and stabilized using erosion control blankets in combination with broadcast seeding and fertilization. The appropriate seed mixtures, soil nutrient requirements, and fertilization rates will be determined following completion of field studies. A schematic plan of the stabilization and revegetation of reach G is shown in Figure 3-7.

Stabilization and Revegetation of Adjacent Area GG

The stabilization and revegetation of adjacent area GG will be located as shown on Figure 3-1. The primary objectives of this component of the preferred alternative are to stabilize and revegetate the disturbed adjacent area GG which will prevent further erosion. The improvements will cover an area of approximately 1.5 acres. A schematic section typical of the stabilization and revegetation for adjacent area GG is shown in Figure 3-8.

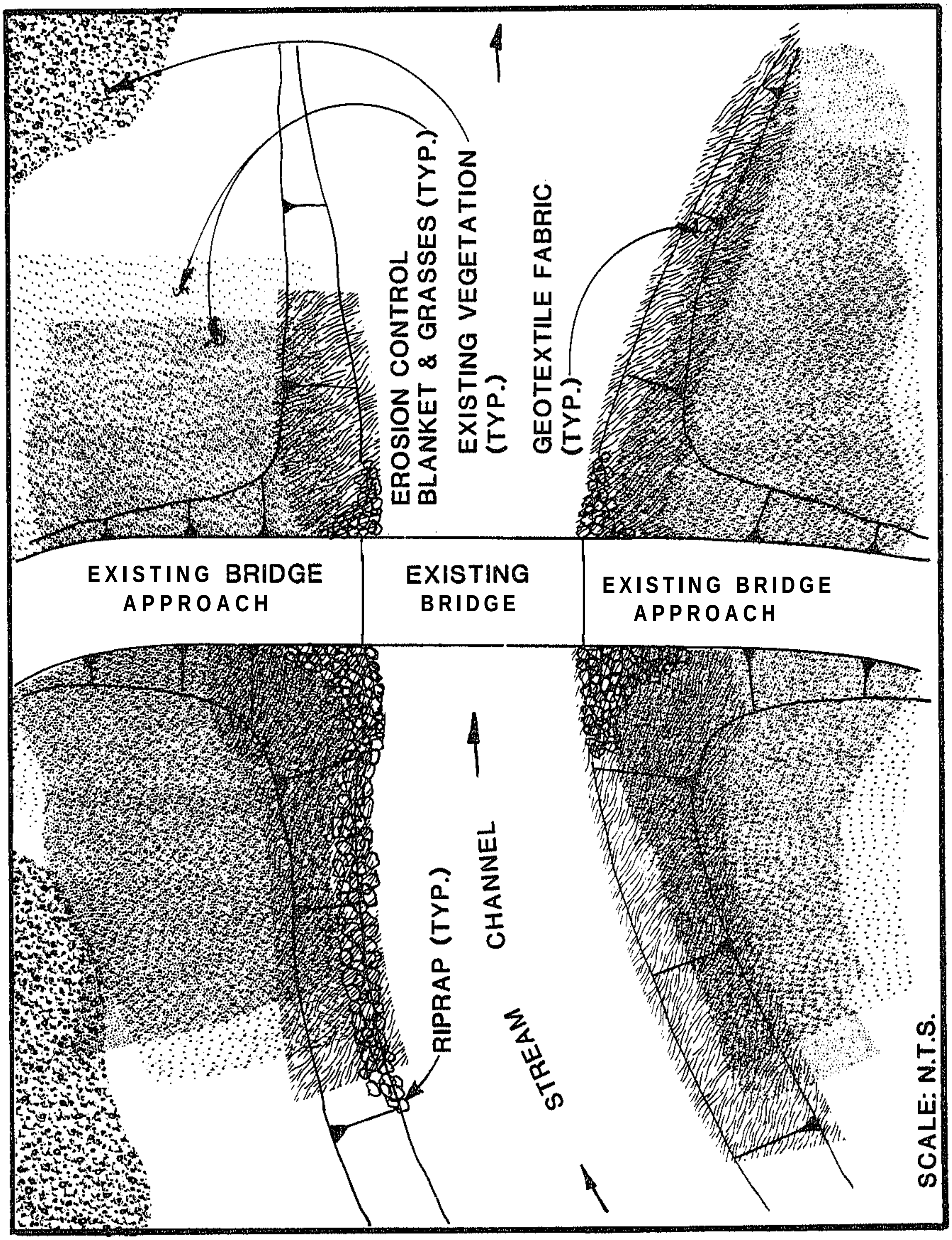
The eroded portions of adjacent area GG will be recontoured and graded to provide small terraces and depressions for collection of runoff and retention of surface water and sediment. These areas will be broadcast seeded and fertilized as appropriate to promote vegetation growth. The most severely distrubed areas will be covered with the erosion control blanket to help minimize erosion and retain moisture for plant growth. Broadcast seeding and fertilization rates for adjacent area GG will be determined after completing field studies to test the effectiveness of various revegetation efforts. Broadcast seeding will be accomplished during the fall seasons just prior to snowfall.

The tributary flowing through adjacent area GG will be stabilized with riprap, the specialized geotextile fabric, erosion control blankets, and vegetation. The riprap will be placed in the tributary channel to stabilize the channel bottom. The banks will be graded back, broadcast seeded, and covered with the erosion control blanket. The geotextile fabric will be installed over the top of the erosion control blanket on the tributary stream channel banks.

Stabilization and Revegetation of Adjacent Area FF

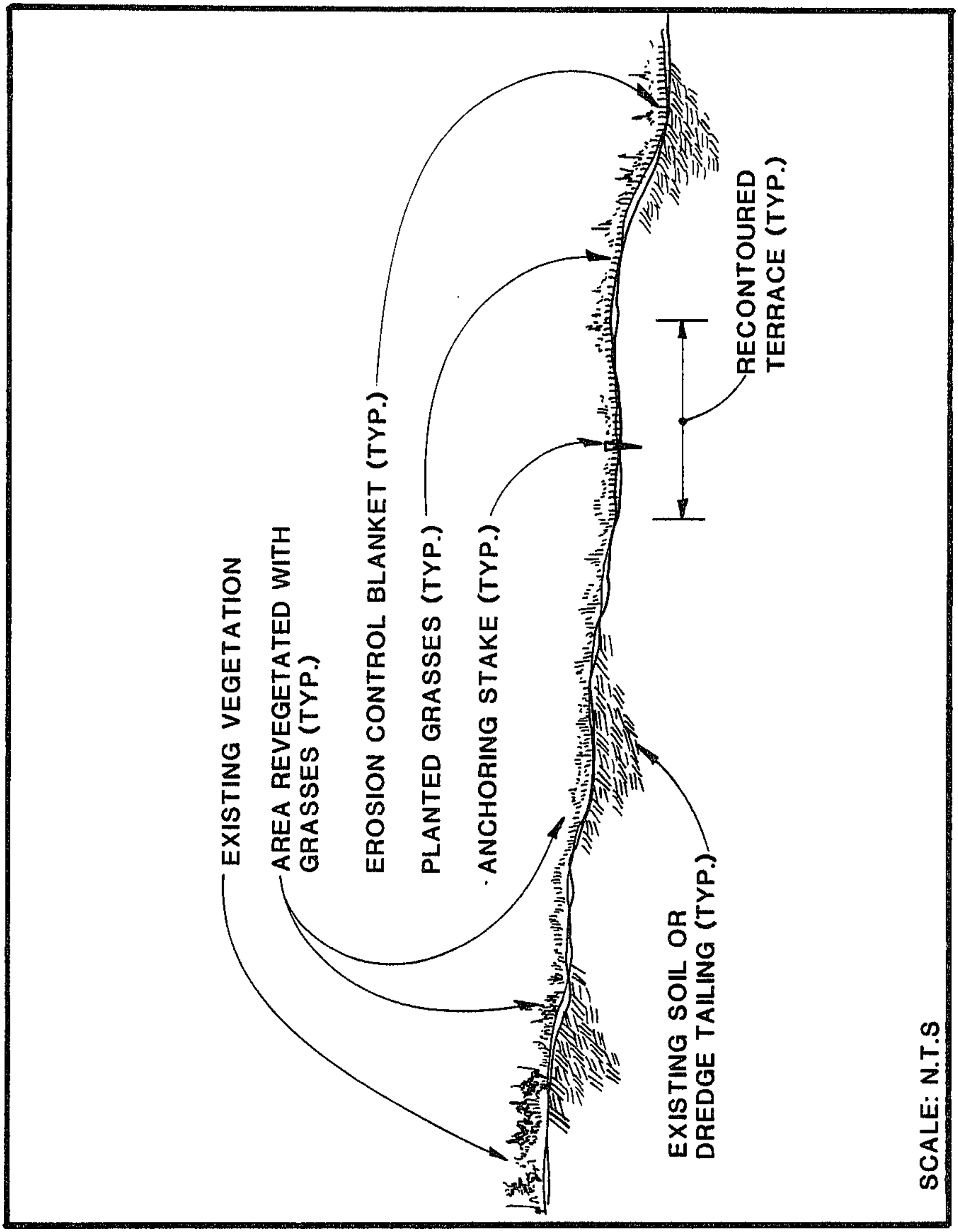
The stabilization and revegetation of adjacent area FF will be located as shown on Figure 3-l. The primary objectives of this component of the preferred alternative are to stabilize and revegetate portions of the disturbed adjacent area FF which will prevent further erosion. Tbe improvements will cover an area of approximately 31 acres. A schematic section typical of the stabilization and revegetation for adjacent area FF is shown in Figure 3-8.

Excess material excavated from the stabilization of stream reaches D and E will be used to fill portions of adjacent area FF. The filled areas would be compacted and contoured to provide small terraces and depressions for collection of runoff and retention of surface water and sediment. These areas will be broad-



SCHEMATIC PLAN OF STREAMBANK STABILIZATION AND REVEGETATION IN REACH G

FIGURE 3-7



SCHEMATIC SECTION TYPICAL OF STABILIZATION AND REVEGETATION FOR ADJACENT AREAS

FIGURE 3 - 8

cast seeded or hydromulched to promote vegetative growth. Seeding and fertilization rates will be determined following completion of field studies to test the effectiveness of various revegetation efforts. Broadcast seeding would be accomplished during the fall season just prior to snowfall. The severely disturbed areas of adjacent area FF will be broadcast seeded and covered with the erosion control blanket to help promote revegetation.

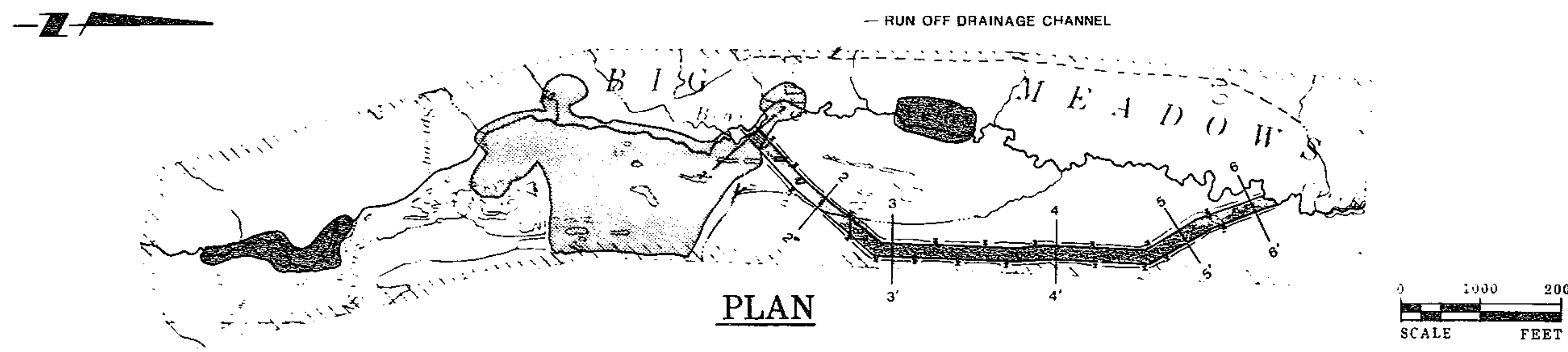
Tributary streams flowing through adjacent area FF to the main stream channel will be stabilized with small riprap and geotextile fabric as necessary. The tributary channels *draining* adjacent area FF are active only *during* and just after the snowmelt runoff season. These channels will be stabilized with a combination of riprap and geotextile fabric, and broadcast seeded to help promote revegetation.

Stream Channel Realignment

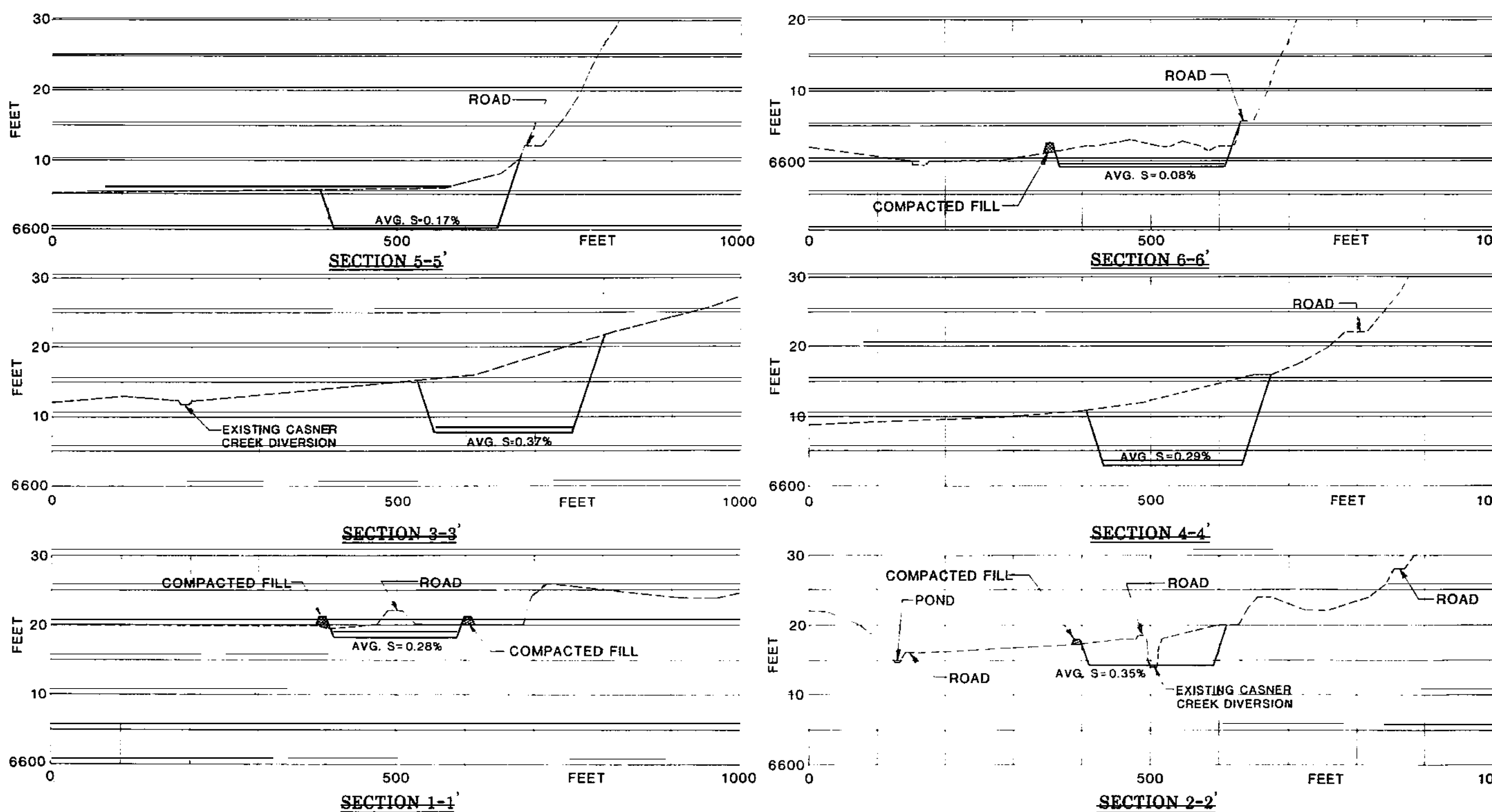
The stream channel realignment would be located as shown on Figure 3-9. The primary objective of this component of the preferred alternative is to establish a new stream channel within a constructed, stabilized, and vegetated floodplain downstream from the enhancement reaches which would accommodate any potential future mining on the patented land. The stream channel realignment would be located entirely on the patented land and cover a total distance of approximately 7,500 feet. A schematic section typical of the proposed stream channel realignment is shown in Figure 3-10.

The stream channel realignment would be constructed similar to the improvements planned for Reach D. The realignment would provide a floodplain for stream meandering and snowmelt runoff flood flows. Cross sections of the constructed floodplain are shown in Figure 3-9. The floodplain would be constructed to provide capacity for the estimated design peak runoff ranging from approximately 400 cfs to 616 cfs throughout its length. The floodplain would range in width from 180 feet to 240 feet throughout the 7,500 foot length, as determined by the approximate width of the existing meander belt of Bear Valley Creek in lower Big Meadows. The proposed floodplain width would be subject to modification during design of the realignment which should include analysis of the backwater curve using the HEC-2 computer model or *equivalent. The* design peak flow would have depth ranging from 1.3 to 2.0 feet in the constructed floodplain and a velocity ranging from 1.3 to 2.0 fps. The constructed floodplain is schematically shown in Figure 3-10.

The banks defining the limits of the constructed floodplain would be sloped 3 to 1 and stabilized with a combination of specialized geotextile fabric, erosion control blanket, vegetation, and riprap. The geotextile fabric under consideration has designed openings that provide for vegetative growth. The erosion control blanket is a natural wood fiber mat which helps promote vegetative growth by retaining soil moisture, controlling soil surface temperature fluctuations, and stabilizing disturbed soil surfaces. The side slopes would first *be* broadcast seeded with an appropriate mixture of grass seeds to encourage revegetation. Soil nutrient requirements and fertilization rates would be determined following completion of field studies. The erosion control blanket would be installed over



PLAN



SECTIONS

BEAR VALLEY CREEK FISH HABITAT ENHANCEMENT PROJECT

FIGURE 3-9

PREFERRED ALTERNATIVE STREAM CHANNEL REALIGNMENT PROJECT

LEGEND

PLAN

- PATENTED LAND BOUNDARY
- D — STABILIZATION AND REVEGETATION OF STREAM REACHES
- GG — STABILIZATION AND REVEGETATION OF ADJACENT AREAS
- I — STREAM REACHES TO RECEIVE FURTHER STUDY IN THE FILED
- 1 — CROSS SECTION LOCATIONS
- PROPOSED FENCING
- PROPOSED STREAM CHANNEL REALIGNMENT

SECTIONS

- PROPOSED CONSTRUCTED FLOODPLAIN
- EXISTING CROSS SECTIONS
- AVG. S — AVERAGE SLOPE
- BVC — BEAR VALLEY CREEK
- COMPACTED FILL

NOTE: ALL CHANNEL SIDE SLOPES ARE 3:1, CROSS SECTION SCALE IS 10 TO 1 VERTICAL EXAGGERATION

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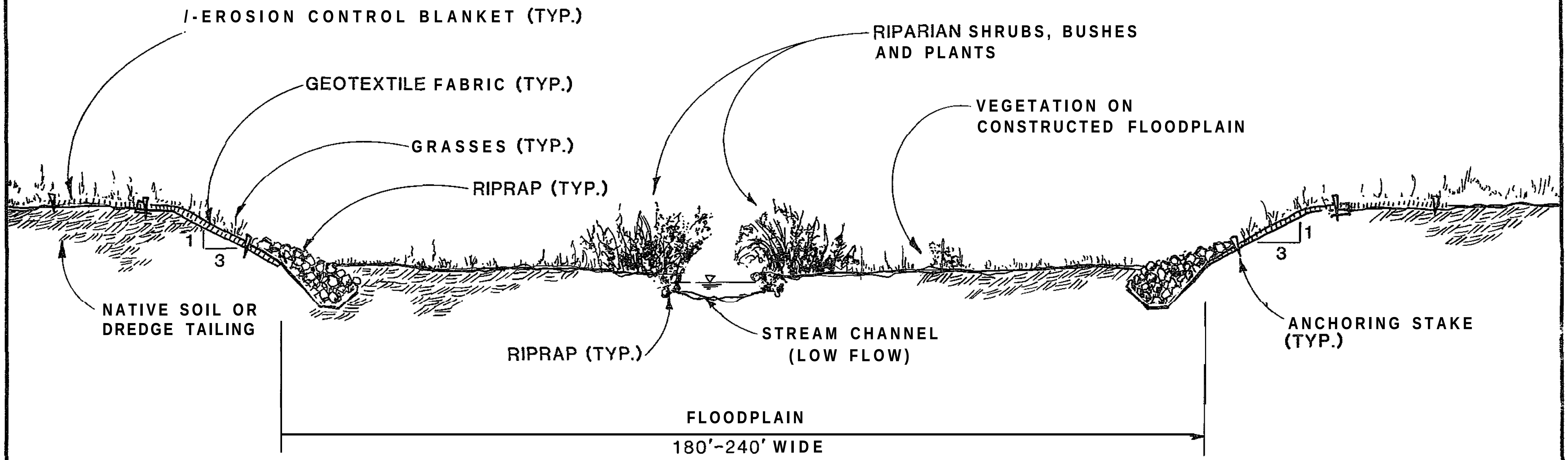


SCALE: N.T.S.

SCHEMATIC SECTION OF STREAMBANK STABILIZATION AND CONSTRUCTED FLOODPLAIN IN STREAM CHANNEL REALIGNMENT

FIGURE 3- 10

the seeded slopes. The geotextile fabric would then be installed over the lower portion of the erosion control mat as shown in Figure 3-10. The riprap would be placed on top of the geotextile fabric at the toe of the side slopes and keyed into the constructed floodplain to a depth of at least two feet below the invert of the realigned low flow stream channel. This would help prevent the stream from continuing a meander into the stabilized floodplain bank. The riprap would have an average diameter of 18 inches and a maximum diameter of 24 inches. The riprap would extend up the slope to a height of one foot above the design peak flow water surface. The overall stabilization of the floodplain banks would be applied to both sides of the floodplain, as shown in Figure 3-10.

A low flow stream channel would be developed within the constructed floodplain after the floodplain has become established with a vegetative mat including riparian plants prior to commencement of any potential future mining activity. Establishment of a vegetation mat within the floodplain would help to minimize erosion and sedimentation from the stream channel as new meanders are created. The slope and elevation of the constructed floodplain would be approximately the same as the existing stream channel alignment (Figure 3-9). The floodplain vegetation would be established in gravelly soils in order to provide a substrate source for Bear Valley Creek when it is diverted into the new constructed floodplain. The stream channel realignment is proposed as a permanent diversion because any potential future mining would result in an estimated 30 to 35 percent swell of the unconsolidated sediments in Big *Meadows. The* swell occurs because when naturally compacted materials are excavated, they are not redeposited in a compacted form, as evidenced by the swelled dredge tailing located at the south end of the patented land. The *stream* channel realignment would be the lowest point in Big Meadows if mining were conducted in the remainder of the valley at some point in the future. Construction of a permanent stream channel realignment prior to any potential future mining would help to avoid the same type of problem which is now occurring in the upstream areas of Bear Valley Creek proposed for enhancement.

After the stream channel establishes a low flow meander sequence in the constructed floodplain, riprap and additional riparian plants would be used to help promote growth of root mats and create small overhangs which provide cover habitat for fish. The riprap would be placed along the stream where necessary to help build and stabilize the banks. Riparian shrubs, bushes, and other plants or cuttings would be planted along the banks as discussed earlier for Reaches D and E. The constructed floodplain would be planted with shrubs and grasses adapted to growing in capillary zone conditions (Claire and Scherzinger, 1978). Soil nutrient requirements and fertilizer application rates would be determined following completion of field studies. The streambank and floodplain construction and revegetation planned for the stream channel realignment are schematically shown in Figure 3-10.

The stream channel realignment would require considerable excavation and construction activity. The floodplain construction would generate an estimated 500,000 cubic yards of excess fill material, which would be used as fill for other areas of the patented land. Additional excavated material would be generated by the construction of a designed drainage channel along the west side of the patented land. The drainage channel would be constructed prior to any potential future mining in order to collect runoff flow from the west side of Big Meadows. The tributary streams drained by the channel would be routed over to the proposed stream channel realignment following reclamation Of the Potential future mining. An approximate alignment of the drainage channel is shown on Figure 3-9. A schematic plan of the stream channel realignment is shown in Figure 3-11. A complete balanced cut and fill plan would have to be prepared as part of the design phase of the stream channel realignment project.

Minor Components

The preferred alternative has several minor components including miscellaneous revegetation of other areas, and fencing around the stabilized and revegetated areas of the patented land. The miscellaneous revegetation will be accomplished on severely disturbed lands not within adjacent areas GG and FF. These disturbed areas have a total area of seven acres within the patented land. A portion of these areas will be stabilized with erosion control blankets and broadcast seeded to promote revegetation. The remaining areas will be hydromulched to help establish new vegetaion. Broadcast seeding, fertilization, and hydromulching application rates will be determined following completion of field studies designed to test the effectiveness of various revegetation strategies.

The stabilized and revegetated areas comprising the preferred alternative will be fenced to help protect the improvements from livestock and wildlife. The fencing will primarily serve to exclude range animals from the revegetated and stabilized areas on the patented land, and will not prevent movement of livestock between meadow areas upstream and downstream of the improvements. A more detailed discussion of the types of fences which could be used, their effectiveness and maintenance requirements, and other aspects relating to livestock access, are presented in Chapter 6 of this report.

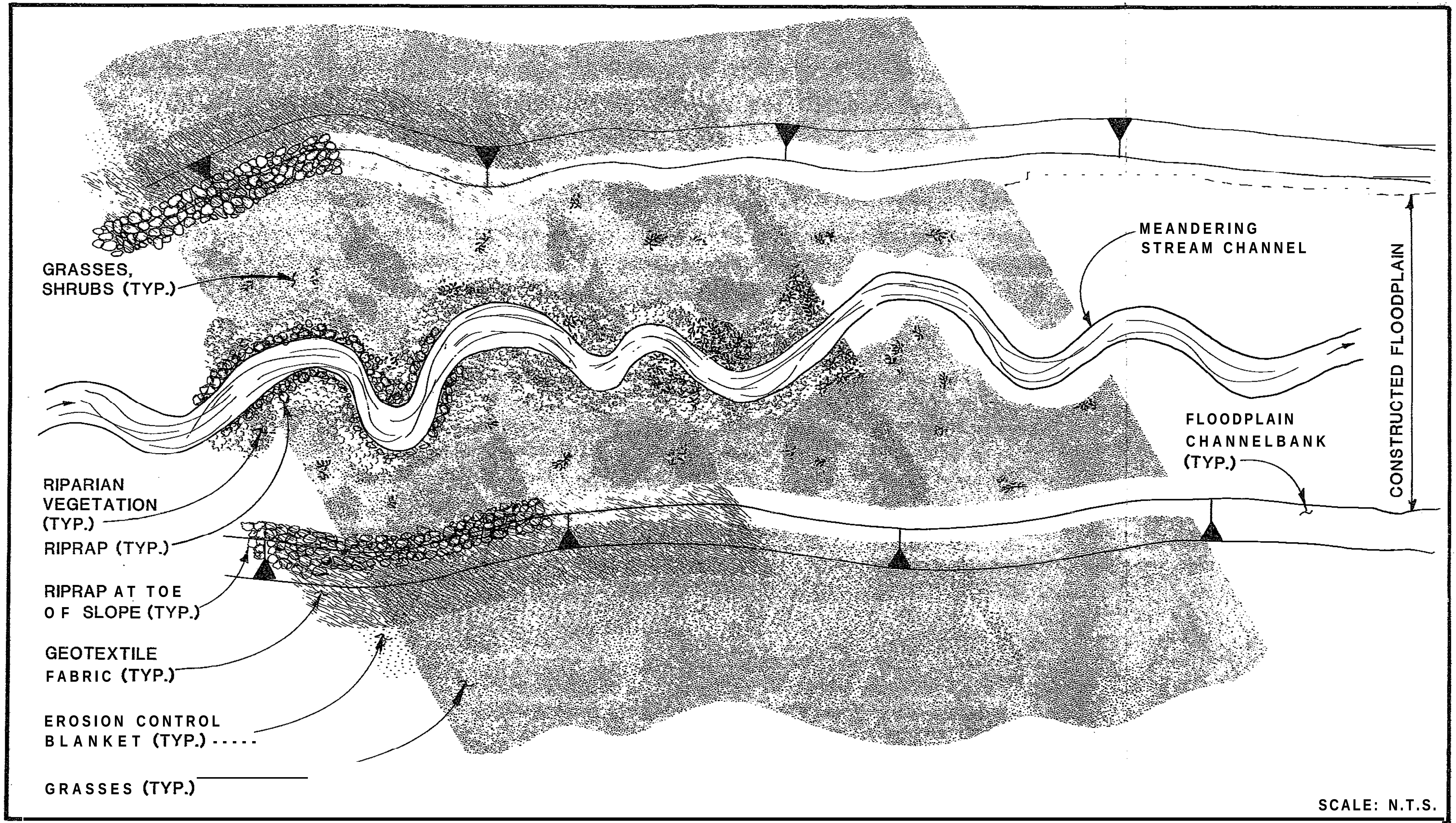
SUMMARY ANALYSIS OF THE PREFERRED ALTERNATIVE

The preferred alternative will provide a feasible, reliable, and effective means of stabilizing and revegetating the three stream reaches and two adjacent areas, and establishing an environmentally sound stream channel realignment taht would accommodate potential future mining. The components comprising the preferred alternative will incorporate several different construction treatments. These treatments are reviewed in the following section. A brief discussion of how the preferred alternative accomplishes the project objectives is included at the end of this section.

Recommended Construction Treatments

The recommended construction treatments discussed in the previous section represent typical construction methods and were selected based on the following criteria:

- Engineering Feasibility
- Constructability



SCHEMATIC PLAN OF STREAMBANK STABILIZATION AND CONSTRUCTED FLOODPLAIN IN STREAM CHANNEL REALIGNMENT

FIGURE 3-I 1

- Reliability
- Effectiveness
- Environmental Compatibility
- Estimated Cost

Each treatment approach was thoroughly researched using the literature collected for the annotated bibliography included with the Draft Feasibility Report (JMM, 1985) and also utilizing manufacturer's and supplier's information. The recommended construction treatments are briefly addressed in Table 3-l. The information provided in Table 3-l includes a brief description, purpose of use, and sequence of use, for each recommended construction treatment.

Referred Alternative and Project Objectives

The preferred alternative is a refinement of Project Alternative IV, plus the. stream channel realignment, as discudded earlier in Chapter 2 and the Draft Feasibility Report (JMM, 1985). This recommended alternative was developed, based on objectives identified for the project by the Tribes, the Interagency Task' Force, and Bear Valley Minerals, Inc. The overall goal of the project is to. enhance fish habitat in the Bear Valley Creek drainage. The implementation of the preferred alternative would directly enhance and protect fish habitat within specific reaches of the patented land, end also would have a major indirect effect on the fish habitat within public lands downstream of the study area. The project objectives were all formulated with the overall goal of enhcncign the available fish habitat within Bear Valley Creek.

The objectives of this project, defined as the potential improvements which could be made within the patented land boundaries, would be accomplished as a result of implementing the enhancement components of the preferred alternative. The project objectives for the patented land are listed below in descending order of priority.

1. Stabilize steambanks and stream channel, and control or reduce erosion to near natural levels.

2. Reduce deposition and/or downstream transport of sediment.

3. Minimize turbidity, and maintain or improve water quality.

4. Improve aesthetics through revegetation and recontouring of the mined areas.

5. Create or improve chinook salmon spawning and rearing habitat.

The project objectives would each be accomplished to some degree by implementation of the enhancement components of the preferred alternative. The first objective would be met by stabilizing and revegetating stream reaches D,, E,,,' and G. Reaches B and I will receive further study in the field to determine the need for stabilization and potential alternatives. The second objective would, be partially accomplished if the first objective is met by successful implementatin

TABLE 3-1

DESCRIPTION OF RECOMMENDED CONSTRUCTION TREATMENTS
BEAR VALLEY CREEK PROJECT STUDY AREA

Treatments	Description	Purpose of Use	Sequence of Use
Riprap	Stone 10" to 18" diameter; placed along toe of streambank slope at depth of 2 feet below invert of stream channel	Anchors geotextile fabric at toe of streambank; armors streambank to prevent erosion	Used after installation of geotextile fabric; placed over top of geotextile fabric; may be placed along streambanks
Geotextile Fabric	Woven, three dimensional matting made of heavy nylon monofilaments	prevents surface erosion, stabilizes soils on streambanks, encourages revegetation of disturbed soils	Installed after grading and/or compaction of streambank is completed; may be installed over top of erosion control blanket
Erosion Control Blanket	Woven, three dimensional matting made of curled wood fibers, with avg. fiber length = 6"	prevents surface erosion, stabilizes soils, encourages revegetation by retaining soil moisture	Installed after grading of soils, broadcast seeding, and fertilization of disturbed area is completed
Hydramulching	Mixture of tiny wood fibers, seed, and fertilizer mixed with water and applied by spraying	Establishes vegetation over large areas, provides stabilization to soils through encouragement of vegetation	Applied after preparation of soils by recontouring and mechanically harrowing disturbed soils
Broadcast Seeding	Mixture of seeds applied to soils by hand or machine	Distributes seeds over disturbed soils to encourage vegetative growth	Applied to soils after surface preparation; before and after installation of erosion control blanket
Fertilizer	Mixture of plant nutrients and chemicals determined by soils analysis	Encourages and stimulates vegetative growth by providing necessary nutrients	Applied to soils before or after broadcast seeding and before installation of erosion control mulch blanket
Riparian Vegetation	Shrubs, bushes, and other plants which grow along streambanks, may be transplanted or planted as cuttings	Develops a root mat in soils along streambanks, and helps retain soil and prevent erosion during flooding events	Shrubs planted following placement of riprap along streambanks; cuttings planted in spring after recession of flood flows; may be used with erosion control blankets
Fencing	Four foot high fence constructed around perimeter of stabilized and revegetated portions of study area	Controls livestock and wildlife access to stabilized and revegetated reaches and areas of project	Installed following completion of all treatments and construction in study area

of stabilization and revegetation measures. Revegetation of adjacent areas GG and FF also would help accomplish the second project objective. Implementation of the preferred alternative would generally meet the third objective, however, it will be difficult to quantitatively measure how much improvement occurs in water quality because no monitoring data for the study area is available. The fourth objective would be accomplished by each of preferred alternative enhancement components. Additional improvement in aesthetics may be realized following implementation of stabilization and revegetation measures in stream reaches B and I. The fifth objective would be partially met within the patented land area by stabilizing the low flow streambanks with riparian vegetation. Implementation of the enhancement components of the preferred alternative which meets the first four objectives would indirectly create, maintain or improve the chinook salmon spawning and rearing habitat in Bear Valley Creek.

Implementation of the stream channel realignment component of the preferred alternative would also meet some of the project objectives as previously listed. All of the project objectives would be met if mining activity commenced on the patented land in the future. The sediment trapped in the existing Bear Valley Creek channel downstream from the bridge in Section 15 would be removed by any potential future mining. The stream channel realignment would not contain sediment deposits from upstream areas, and chinook salmon spawning and rearing habitat could be created within the new stream channel. An additional related objective that would be met by implementation of the stream channel realignment is the maintenance of fish passage and protection from the mining activity. A buffer zone could be established between the stream channel realignment and any potential mining panels located on the east side of Big Meadows. This would help ensure the stream channel realignment is maintained in an environmentally sound manner and is protected from any potential future mining activity.

SUMMARY

This chapter has described the components of the preferred alternative, presented recommended construction treatments, and discussed the project objectives in terms of the proposed implementation measures. The preferred alternative includes the stabilization and revegetation of three stream reaches and two adjacent areas, and a stream channel realignment, all located within the patented land boundaries. Stream reaches B and I will be given further consideration in the field to determine the need for recommended improvements and evaluate potential alternatives. Chapter 4 presents implementation considerations of the preferred alternative.

CHAPTER 4

IMPLEMENTATION OF THE PREFERRED ALTERNATIVE

INTRODUCTION

This chapter provides a discussion of implementation considerations for the Bear Valley Creek Fish Habitat Enhancement Project preferred alternative. The implementation considerations are those regulatory and institutional aspects of the project which must be fulfilled before construction may commence. The implementation considerations include land ownership, potential conflicts with existing and future land uses, end permit requirements and acquisition. The preferred alternative is discussed below in terms of these implementation considerations.

LAND OWNERSHIP

The enhancement portion of the preferred alternative involves enhancement of fish habitat end construction of erosion control 'measures within the boundaries of the patented land on Bear Valley Creek. The patented land is owned by Bear Valley Minerals, Inc. of Denver, Colorado, and includes 910 acres within Big Meadows. The application for patent of the six mineral claims comprising the private lend was filed in July 1961 and granted on April 30, 1962-under patient number 1226626. The patent applies to both surface and mineral rights. The stream channel realignment portion of the preferred alternative, would be located entirely within the boundaries of the patented land. The proposed realignment would be constructed by bear Valley Minerals, Inc. prior to any potential future mining. The USFS maintains an easement through the patented land along the existing public access road alignments, and construction of the stream channel realignment across the public road would require USFS approval.

Bear Valley Minerals, Inc. granted an easement to the Tribes in May 1984 for conducting, a feasibility study within the boundaries of the patented land. The current easement allows the Tribes access onto the patented land for study and evaluation purposes only. A new easement and additional written agreements between Bear Valley Minerals, Inc. and the Tribes will have to be executed before any construction activities may 'begin. The new easement will supercede the current easement, and Bear Valley Minerals, Inc. has overall control over implementation of the improvements designed to stabilize the patented land and protect downstream fish habitat.

There will be no National Forest System lands involved with the construction of the preferred alternative in Big Measows. However, the nescessity to develop an adequate source of riprap for streambank and floodplain stabilization will require locating a quarry site on National Forest land outside of the Big Meadows area. There are currently two established sites. that have been used by the USFS as a source of riprap located within the Bear Valley Creek drainage. An additional potential source of riprap for the project may be on Whitehawk Mountain, which is part of the National Forest System land under management by the lowman Ranger District, Boise National Forest. Permitting requirements for use of

National Forest System lands as a source for riprap are discussed later in this chapter.

POTENTIAL CONFLICTS WITH EXISTING AND FUTURE LAND USES

The existing and future land uses of the study area must be considered in the implementation of the preferred alternative. The primary existing and future land uses of the patented land are grazing operations and potential mineral development activity. Potential effects of the preferred alternative on the existing grazing operations are discussed in Chapter 6 of this report. Other existing land uses within the patented land include wildlife habitat and specifically potential habitat for the Northern Rocky Mountain gray wolf, transportation and access, and public recreition. Construction activities associated with implementing the preferred alternative may have a short term effect on wildlife inhabiting the patented land. The fencing may exclude some wildlife from presently utilized areas, however, the majority of the area in question is currently in poor vegetative condition in terms of its grazing or browsing potential. The potential conflicts with the gray wolf are discussed iii a separate biological evaluation report being prep&red as part of this project. Vehicular transportation on the roads within the patented land may be affected during construction of the improvements, however, the enhancement portion of the project at completion will have no significant effect on access. The stream channel realignment portion of the preferred alternative would interrupt access to National Forest System lands on the west side of Big Meadows, and a new bridge may have to be provided as part of the realignment to provide access to the public lands. Recreation involving the existing shallow ponds or other portions of the patented land is currently limited but would be further discouraged with fencing in order to protect the stabilitiation and revegetation efforts.

potential future mining of the patented land in Bear Valley could have moderate conflicts with the preferred alternative. The entire length of stream reaches D, E, and G **is** adjacent to the previously mined tailing deposits on the east and unmined land on the west. Adjacent area GG also borders lands which could be mined by Bear Valley Minerals, Inc. The preferred alternative could be compatible with potential mining activity if a buffer ‘strip is maintained between the west bank of the stream reaches and future mining panels. Bear Valley Minerals, Inc. or the mining operator would have to, construct diversions around the area south of the bridge crossing, in Section 15 in order to conduct future mining activity. Stabilization of reach “G’could be in conflict- with future mining activity as it apparently contains unmined and proven mineral resource values. Bear Valley Minerals, Inc. has indicated an interest in maintaining a portion of adjacent area FF as a staging area for construction related to potential future mining activity. It should be noted that no additional mining could take place without a modification of the current regulations limiting dredge mining in the Middle Fork Salmon River drainage. None of the elements incorporated into the preferred alternative would in. any way curtail or preclude future mining or reclamation.

PRRMIT REQUIREMENTS AND ACQUISITIQN

The permits, actions, and/or approvals required for the preferred alternative will have to be acquired prior, to beginning construciton activite=ies. The permit requirements and a best case acquistion schedule for the enhancement portion of the preferred alternative are discussed below.

Permit Requirements

The Bear Valley Creek Fish Habitat Enhancement Project will require permits approvals, and/or actions from various Federal and State agencies. Some of the regulatory agencies responsible for permitting the project are represented on hte Interagency Task Force. The permit requriemnts were initially discussed in the Bear Valley Fish Habitat Enhcncement Project Technical Memorandum No. (JMM, 1985). The permits, actions, and/or approvals required for the enhance. ment portion of the preferred alternative are listed below along, with the responsible agency.

- NEPA Compliance 7 Bonneville, Power Administration
- Section 7, Endangered Species Act, Biological Evalustion of Gray Wolf (Informal Consultation) USDI-Fish and Wildlife Service
- Wild and Scenic Rivers Consultation - USDA and USDI
- Special Use Permit, Road Use Agreement for Commercial Hauling - USDA-Forest Service
- Special Use {er,ot. Cpmstricotpm <ateroa; Source [Riprap) on National Forest System Land-USDA-Forest Service
- NPDES Applicability Determination - U.S. Environmental Protection Agency
- Section 404Permit - 'U.S. Army, Corps of Engineers
- Compliance with, Executive Order 1.1988 (Floodplain Management) and 11990 (Proteetionl,of Wetlands) - U.S. Army Corps of Engineers
- Stream Channel Alteration Permits - Idaho Department of Water, Resources
- "Special Resource Water" Constulation - Idaho Department of Health and Welfare, Division of Environment

Each of these permits, actions, consultation, and/or 'approvals must be obtatined prior, to commencement of construciton activities. The permit application preparation process will require significatnt lead times, and some of, the permits can only be granted with submittal of detailed engineering design drawings and specific&i&m. The permitting requirements for the enhancement portion of the preferred alternative are summarized in Table 4-l by regulatory agency, permit or action, lead time for permit preparation, agency review time, and duration of the permit. Pertinent comments are included with the permitting requirements summary in Table 4-l. The permit preparation lead times and comments are based on prior permitting experience and information gathered from the specific agencies. Permits or approvals which involve completing simple forms, applications, correspondence or notifications are denoted "minimal" in Table 4-l. The agency review times are based on actual statutes, where applicable, and on agency practices. The agency review periods depend upon a number of factors, including availability of information and efficiency of review personnel.

Permit Acquisition Scheduling

Implementation of the enhancement portion of the preferred alternative will involve the acquisition of all required permits within a specified time period. A permit acquisition schedule has been developed to help coordinate the preparation, submittal and approval of the required permits that will allow construction to commence (Figure 4-l). A delay in preparation and/or submittal of certain permit applications may result in postponing construction of key components until the 1986 season. The Bear Valley Creek project area has a definite construction "window" or season which lasts from mid-July through late October or when the first snowfall occurs. Some permitting activities are dependent on certain necessary field studies and data verification during the spring and summer season, 1985 (Figure 4-l).

Permitting for the **Stream Channel Realignment**

The permitting for the stream channel realignment must be prepared separately from the enhancement portion of the project, according to current interpretation of Federal and State of Idaho laws and regulations governing stream channel alterations. The stream channel realignment would require submittal of the completed COE 404 permit application and the completed IDWR Stream Channel Alteration permit application with detailed design and specifications and an explanation of the purpose of and reason for the proposed diversion. Since the stream channel realignment would be associated with potential future mining activities, filing of the permit applications could prompt the responsible and reviewing agencies to request a mining operation plan and a mining reclamation plan. Submittal of the COE 404 permit application could trigger the requirement of an environmental impact statement (EIS) on the project, which would defer any action on the application until completion and acceptance of the EIS. The stream channel alteration permits may only be issued on a project by project basis from year to year, and there are no "blanket" permits which cover stream channel alterations for enhancement activities and potential mining activities.

Other permit applications and/or approvals which could lead to an EIS on the stream channel realignment portion of the project include: 1) the COE compliance requirements for protection of wetlands and floodplain management; 2) the USFWS consultation process for endangered or threatened species regarding the gray wolf; 3) the EPA requirements for a National Pollutant Discharge Elimination System (NPDES) permit; and 4) the USFS special use permit for access

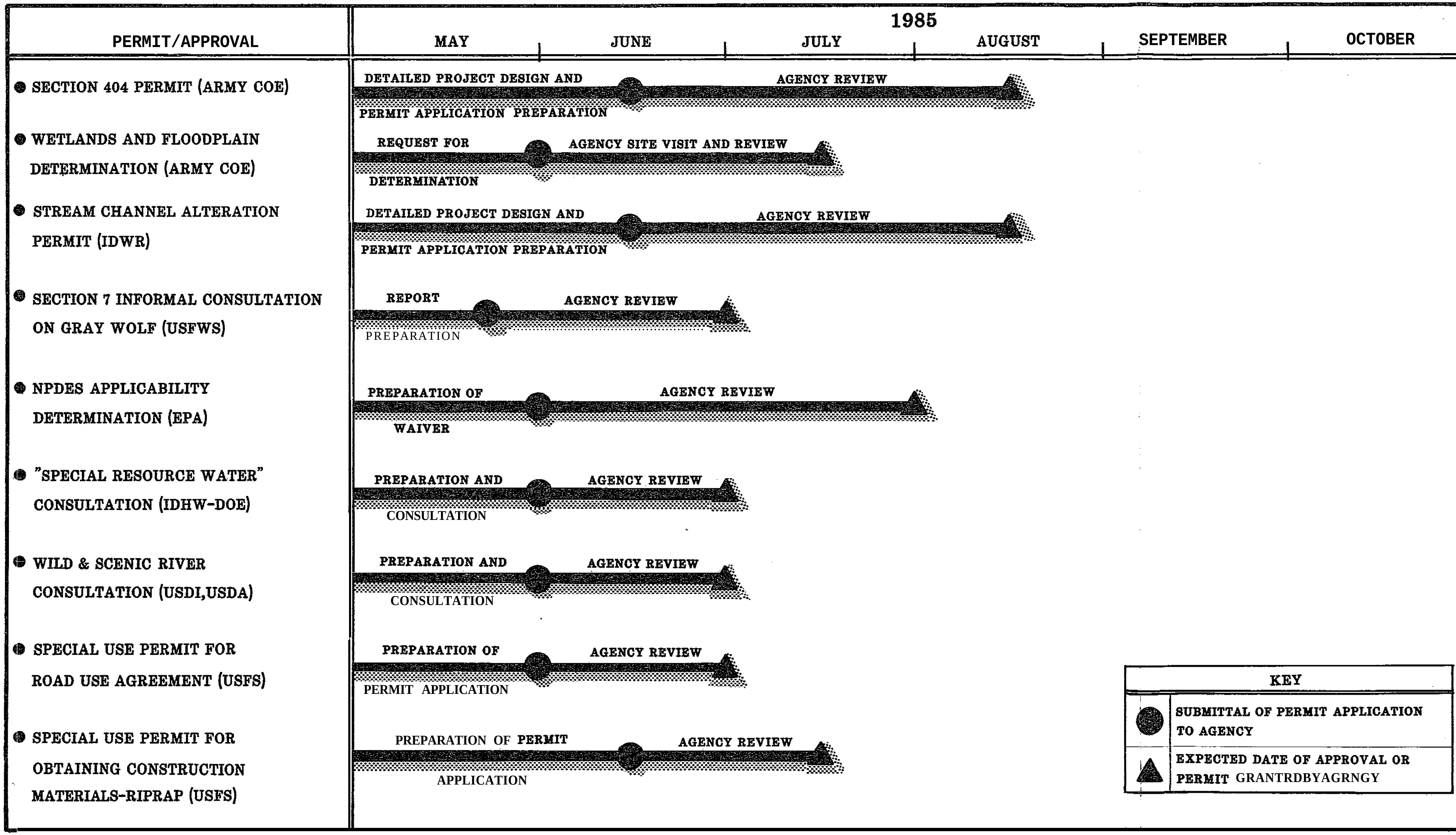
TABLE 4-1

PERMIlTfNG R.EQUl.RBMENTS SUMMARY
FOR B E R VALLEY CREEK FISH HABITAT ENHABCEMENT PROJECT

Regulatory Agency	Permit or Action	Lead Time (Monthd for Permit Preparation	Agency Review Time (Months)	Duration	Comments
Dept. of Defense, U.S. Army Corps of Engineers (COE)	Permit for discharge of dredged or fill material (404 permit)	2-3	2-6	Life [illegible]	May be rcqulrcd, bared on dredge and fill quantltler for the selected alternative. Can Involve significant lead times, and potentially trigger EIS PROCESS. Detailed engineering desing required for permit. Constructloa must commence within 1 year of Issuance (33 CFR 320 et. req.).
	compliance with Excutive Orders 11988 (Floodplain Mange-ment) and I 1990 (Protection of Wetlands)	1-3	2-6	Life of activiey	A determination may be made by the Army COE following on-rite lnspectlon of the areas proposed for conrtructloa activity. If the af fected area is determined a floodplain or wet-land, the Army COE may required additional in-formation to be rubmltted with the 404 permlt ● ppllcatlon. A positive determlnatlon may also triggewr an EIS or EA process.
State Department of Water Resources	Stream Channel Alteration Permit	2-3	2-3	Life of ● ctlrlty	Stream channel alteration permit may be sub-mitted on a joint IDWR/Army COE ● ppllca-tion. XDWR also requires detailed design drawngs and specifications for permit. Separ-ate permit appllcatlonr must be submitted for each stream channel alteration rite. Other Idaho agenclea have comment opportunity on petmlt ● ppllcatlona.
U.S. Flsh & Wildlife Sercicw (USFWS)	Consultation process for Endangered or Threatened Species (Section 7) Gray Wolf	1	2	Lifeof● ctivity	This consultation has been Initiated. The USFWS has lndlcatad that an Informal consultation will be adequate for this project. The Informal consultation will tequlre preparation of a bioogical evaluatlon on the gray wolf.
U.S. Environmental Protection Agency (EPA)	National Pollutant Discharge Ellmlnatlon System (NPDES) applicability determlnatlon	1-2	6 (mInImum for permit lasuance)	5 years	An official applicability determination should be secured from EPA. This proces should be Inltlated immediately, Including investgatin the potential to secure a waiver and/or tem-porary oernut civerubg conettuctlon actuvutues,
National Ebvuribnebtak Policy Act (NEPA)	Campllance wutg NEPA	t-12	6	Life of activiey unless project sign0 fiaantly modlfled.	The NEPA compliance process la belng con-ducted by BPA. Compliance is required by all federal agencies under NEPA when actlonr in-volving the agencies could result In or lead to ● tgnlflcant Impacts on the human environment.

TABLE 4-1 (coat.)

Regulatory Agency	Permit or Action	Lead Time (Months) for Permit Preparation	Agency Review Time (Months)	Duration	Comment8
State of Idaho Water Quality Standards "Special Resource Water Designation"	Written consultation with IDHW-DOE regarding any potcntlai special mitigation requirements during construction, BMP appilcation, and special noncompliance rairerr, etc.	Minimal (consultation)	2	Conrttuction period	The stream couse which will be affected by project conrtructlon is presently classified an a "Speceial Resource Water.' This is due to outstanding high quality, itr Includon In the Natlonal Wild and Scenic River Systme, and the paramount interest (both statewide and national) in the watercourse. Accordingl, any proposal to modify the stream course which would Involve either temporary or long-term water quality degrasation may be subject to special review and/or provisions by IDHW. It is recommended that early consultation with the DOE be inltiated, for there reasons.
Wild b *Scenic* River System Classification (16 U.S.C. 1271-1287)	Written consultation with the Department of Interior and Department of Agriculture	Minimal (ocnsultaition)	2	Consulation period	The Tribes rhouid formally consult (notify) the Secretary of the Interior and Secretary of Agriculture In writing of Its intentions regarding the Beu Valley Creek Fisheries Habltat Enhancement project, and tht selected alternative. This conrultatlon Is Important *from* • deocumentaion● rptct.
USDA-Forest Service	Special Use Permit for access and egress needs (commercial use)	Minimal (Road Ust Estimates)	2-3	Annual requiremtnt	Permit will be rtquired for any hauling and commercial road use. Depending on the construction schedule, this may also Involve snow removal. The actual permit preparatlon times art short, and involve such submitals as estlmated road use by vehicle type.
	Special Use Permit for obtaining riprap (rock construction material) from and approved site	1	2-3	Annual requirement	There art several potential sites on the Boise *National* Forest In the Bear Valley Creek drainage which could bt a source *of* riprap. These sites will *hart* to be further studied In the field with USFS personnel. Tht permit wil be Issued by the Lowman Ranger District, and the acquisition ot thb permlt should be Inltiated as soon as possibit.



1985 PERMIT ACQUISITION SCHEDULE
BEAR VALLEY CREEK FISH HABITAT ENHANCEMENT PROJECT

FIGURE 4-1

and/or construction materials. Most of these Federal permits are issued on a season-by-season basis, and must be renewed each year.

In order to submit permit applications for the stream channel realignment, field studies would first have to be performed to complete the detailed design and specifications. The field studies could include water quality and hydrological monitoring, hydrogeological testing, materials and soils testing, vegetation studies, surveying, and other miscellaneous studies. The field studies would have to be completed before commencing the detailed design of the stream channel realignment, and they could be started during the 1985 field season.

The permit acquisition schedule for the stream channel realignment is dependent upon when Bear Valley Minerals, Inc. anticipates constructing the diversion and new floodplain. The construction must begin within one year of obtaining a COE 404 permit, and other permits associated with the stream channel realignment also are granted for implementation within specific time periods. The schedule for permit acquisition could also be influenced by the amendment to the Wild and Scenic Rivers Act which currently limits dredge mining within the Middle Fork Salmon River drainage.

SUMMARY

This chapter has discussed land ownership of the patented land, provided an overview of potential conflicts with existing and future land uses, and presented permitting reuqurements and a permit acquisition schedule, related to implementation of the preferred alternative. Many of these aspects of the project must be completed and/or resolved prior to beginning the construction effort. Construction considerations related to the project are discussed in Chapter 5.

CHAPTER 5

CONSTRUCTION CONSIDERATIONS FOR THE PREFERRED ALTERNATIVE

INTRODUCTION

This chapter provides estimated construction quantities, a refined preliminary cost estimate, and a discussion on phasing of construction and construction scheduling, for the preferred alternative. Information included in this chapter of the report is refined from that presented in the Draft Feasibility Report (JMM, 1985), and the Selected Alternative Report (JMM, 1985), and will be used to guide design of the preferred alternative for the Bear Valley Creek Fish Habitat Enhancement Project. Construction considerations for the preferred alternative are discussed below.

ESTIMATED CONSTRUCTION QUANTITIES FOR ENHANCEMENT

The construction quantities for the enhancement portion of the preferred alternative were estimated in order to develop a preliminary cost for the project. These estimated constructed quantities were made using information derived from 1) topographic maps of the study area (Bear Valley Minerals, Inc., 1985) with two foot contours at a horizontal scale of one inch equals 100 feet, and 2) USFS cross sections on the patented land. All quantities presented in this report are estimates which will be verified during design.

A number of assumptions have been made in order to develop the estimated construction quantities. Excavation volumes for construction of the floodplain in stream reaches D and E were developed using the cross sections shown in Figure 3-l. The volumes for loading, hauling, compaction, grading and riprap were obtained from the one inch equals 100 feet (100 scale) topographic maps. Surface areas for stabilization and revegetation in the stream reaches and ADJACENT areas also were made using the 100 scale topographic maps. Preliminary sizing of the floodplain construction was accomplished using a hydraulic section method for open channel flow from Chow (1959). Key assumptions for the hydraulic section calculations include: 1) floodplain boundary side slopes of 3 to 1; 2) stream channel gradients shown in the sections on Figure 3-l; 3) Manning's coefficient of friction estimated at 0.050; 4) floodplain channel width estimated at 180 feet; 5) peak streamflows estimated from the 1974 snowmelt runoff as modeled using the HEC-1 computer model (Draft Feasibility Report, JMM, 1985); and 6) channel freeboard estimates made using recommended freeboard and height of bank guidelines from Chow (1959). The assumed floodplain widths will be verified during the design phase using the HEC-2 backwater profile computer model.

Geotextile fabric for stabilization of floodplain channel side slopes was assumed to extend to a depth of two feet below the stream channel invert and extend out five feet from the toe of the slope. The geotextile fabric also was assumed to extend three feet out from the top of the floodplain channel slope. Erosion control blankets for revegetation were assumed to cover the inboard banks and outboard areas associated with the floodplain. The geot extile fabric and erosion control blankets were assumed to be anchored with wood and/or wire stakes, placed at three foot centers. Riprap for anchoring the geotextile fabric at the toe of the floodplain channel bank was assumed to extend to a depth two feet below the stream channel invert, and one foot above the depth of the design peak flow in the floodplain channel.

The estimated construction quantities for the enhancement portion of the preferred alternative are presented by component in Table 5-1. These estimated construction quantities were calculated based upon the assumptions stated above.

PRELIMINARY COST ESTIMATE FOR ENHANCEMENT

The preliminary cost estimate is based on preliminary estimates of quantities for the various enhancement components of the preferred alternative. Unit costs for materials, equipment, labor, and other items have been compiled from various sources including local contractors, manufacturers, other current construction projects in the region, and the Means Site Work Cost Data 1985 and Building Construction Cost Data 1985 estimating manuals (Means, 1985). The preliminary cost estimates for the enhancement components of the preferred alternative represent feasibility level estimates. Estimates of costs for mobilization and demobilization, contingencies, special construction problems, engineering and surveying services, administration and legal services, and construction management are included.

Unit Costs for Construction and Other Costs

The unit costs presented in this report include material costs, construction equipment costs, labor costs, and contractor's/subcontractor's overhead and profit. All unit costs are established at mid-1985 levels and keyed to an Engineering News Record (ENR) construction cost index value of 4200. The ENR index is based on an average construction cost for 20 selected cities in the U.S. and may be utilized to update the costs used in this report by comparing the ENR construction index value to the mid-1985 index value of 4200. The ENR index will be used to update the estimated costs of construction planned for the 1985 and subsequent construction seasons. The unit costs for the various construction elements anticipated for the Bear Valley Creek project are presented in Table 5-2. These unit costs are applied to the quantities listed in Table 5-l to compute the unweighted estimated construction costs presented later in this chapter. Mobilization and demobilization costs were estimated based on equipment requirements for the project and an assumed work camp location 17 miles from the construction site in Lowman, Idaho.

The other costs associated with construction are included as a percentage of the estimated construction cost as shown below.

- contingencies @ **25** percent of the total estimated construction cost

TABLE 5-1

ESTIMATED QUANTITTIES FOR CONSTRUCTION OF THE ENHANCEMENT PORTION OF THE PREFERRED ALTERNATIVE

	Component	unit	Value
1.	Stabilization and Revegetation of Reach D		
	General Excavation	cu yd	26,,000
	Specialized Excavation	cu yd	18,000
	Loading and Hauling	cu yd	44,000
	Fill and Compaction	cu yd	36;OO0
	Grading and Leveling	cu yd	22,000
	Riprap	cu yd	1,500
	Geotextile Fabric	sq Yd	10,000
	Erosion Control Blanket, Seeding and Fertilization	sq yd	15,500
	Riparian Revegetation	sq yd	3,500
	Floodplain Revegetation	sq yd	20,000
2.	Stabilization and Revegetation of Reach E		
	General Excavation	cu yd	**18,000**
	Special Excavation	cu yd	12,000
	Loading and Hauling	acu yd	30,000
	Fill and Compaction	cu yd	26,000
	Grading and Leveling	cu yd	15,000
	Riprap	cu yd	1,000
	Geotextile Fabric	sq yd	8,000
	Erosion Control Blanket, Seeding and Fertilization	sq yd	14,000,
	Riparien Revegetation	sq yd	4,000
	Floodplain Revegetation	sq yd	16,000
3.	Stabilization and Revegetation of Reach G		
	General Excavation	cu yd	6,000
	Fill and Compaction	cu yd	6,000
	Riprap	cu yd	1,200
	Geotextile Fabric	sq yd	4,000
	Erosion Control Blanket, Seeding and Fertilization	sq yd	6,200
	Riparian Revegetation	sq yd	1,000
4.	Stabilization and Revegetation of Adjacent Area GG		
	General Excavation	cu yd	200
	Fill and Compaction	cu yd	200
	Grading and Leveling	cu yd	200
	Riprap	cu yd	60
	Geotextile Fabric	sq yd	700
	Erosion Control Blanket, Seedind and Fertilization	sq yd	5,000

TABLE 5-1 (cont.)

Component		Unit	Value
5.	Stabilization and Revegetation of Adjacent Area FF		
	General Excavation	cu yd	1,000
	Fill and Compaction	cu yd	1,000
	Grading and Leveling	cu yd	1,000
	Riprap	cu yd	300
	Geotextile Fabric	sq yd	2,000
	Erosion Control Blanket, Seeding and Fertilization	sq yd	3,000
	Other Seeding and Hydeomulching	sq yd	,145,000
6.	Minor Components		
	Fencing	lin ft	13,000
	Erosion Control Blanket, Seeding and Fertilization	sq yd	7,000
	Other Seeding and Hydromulching	sq yd	28,000

TABLE 5-2

ESTIMATED UNIT COSTS FOR CONSTRUCITON OF THE
BEAR VALLEY CREEK FISH HABITAT ENHANCEMENT PROJECT
(ENR INDEX OF 4200)

	Item (Description)	Estimated Cost ($)	Unit
1.	General Excavation (Backhoe, Dozer, Scraper, and Loader-average)	2.50	cu yd
2.	Specialized Excavation (Dozer operating near existing stream channel)	3.70	cu yd
3.	Grading and Leveling (Dozer)	2.00	cu yd
4.	Fill and Compaction (Dozer and Roller/Blade)	1.50	cu yd
5.	Loading and Hauling (Loader and 12 yd Dumper - 2 mile round trip haul)	1.50	cu yd
6.	Riprap (Assumes nearby source, drilling,, shooting, loading, hauling, machine placement--dumping)	55.00	cu yd
7.	Geotextile Fabric	7.00	sq yd
a.	Erosion Control Blanket, Seeding and Fertilization	1.90	sq yd
9.	Hydromulching (seeds, fertilizer, fibers, and tackifier; application)	0.50	sq yd
10.	Broadcast Seeding	0.35	sq yd
11.	Fertilization	0.15	sq yd
12.	Riparisn Vegetation Planting and Transplsnting	10.00	sq yd
13.	Floodplain Revegetation	1.50	sq yd
14.	Fencing	0.75	lin ft

special construction problems including wet excavation, site isolation, logistical support, stream channel construction, weather, and mountain meadow environment @ 10 percent of the total estimated construction cost

These costs are added to the estimated unweighted construction cost, and a subtotal estimated construction cost is obtained for the enhancement portion of the preferred alternative. The engineering and surveying, administrative and legal, and construction management services costs are estimated as shown below.

- Engineering and Surveying includes three distinct elements.

  - Design engineering, @ 6 percent of the estimated construction cost, based upon ASCE Manual of Practice No. 45 Curve B (pg. 31)

  - Surveying for 38 field days and 14 office days (over the entire.3 year project, re-establishment of grades, stakes and corners, and some resurveying will be necessary). Current rate at $700~ - $800 a day including per diem and travel.

  - Testing - if soils, foundation and/or hydrogeologic testing and monitoring are necessary. Estimated at 0.75 percent' of the estimated construciton cost.

  The engineering and surveying includes: 1) limited design in the, office to a level which can be presented in drawings, and specifications to a construction subcontractor; 2) field verification of engineering assumptions; and 3) field surveying for construction quantities.

- Legal, Administrative, and Permitting @ 1.6 percent of the 'estimated construction cost. Support information for the permitting will be developed under the design portion of the project.

- Construction Management Services assumes a design/csnstruction type contract. Costs for field office time over the three year project are estimated below.

  Field Labor: 6.5 months/year x 174 manhours/month x $5O/hr x 1.10 (overtime charges) x 3 years = $186,000

  Field Per Diem: $30/day x 145 days/year x 3 years = $13,000

  Office Labor: 30 days/year x 8 hr/day x $55/hour x 3 years = $40,000

  Office Expenses: $5,000 for 3 years

The construction management services cost estimate is based on JMM experience working in field conditions, and includes: 1) significant field engineering; 2) construciton monitoring; 3) responsibility as the general oontractor; 4) construciotn scheduling; 5) reporting; end 6) completing record drawings.

Preliminary Construction Cost Estimate

The preliminary construction cost estimate is a feasibility level estimate which is approximate and computed without detailed engineering data or design. JMM typically assumes an accuracy of plus 50 percent and minus 30 percent for this level of preliminary cost estimate. However, this construction cost estimate has been refined over that presented in the Draft Feasibility Report (JMM, 1985) and the Selected Alternative Report (JMM, 1985). The construction cost estimate for the enhancement portion of the preferred alternative is summarized in Table 5-3. The construction cost estimate is summarized in terms of the six enhancement components of the preferred alternative. The preliminary cost estimate (ENR 4200) for the enhancement portion of the preferred alternative is $2,153,000.

PHASING OF CONSTRUCTION FOR ENHANCEMENT

The construction of the enhancement portion of the preferred alternative will have to be phased over two or more years because of the following:

1. The amount of restoration work necessary cannot physically be completed in 1985 given the relatively limited construction season.

2. Vegetation test plots to be established and monitored during 1985 and 1986 will determine much of the revegetation strategy.

3. Stream reaches B and I must be given further consideration in the field before determining the need for and extent of improvemtints. Such determination may not be made until July 1985.

4. The amount of annual funding available for design and construction activities for this project will require phasing of the construction.

Phasing of the construction planned for' the patented land in, Bear Valley will affect the overall project cost in several ways. Mobilization and demobilization will occur during each construction season, end this cost must be added to the remaining project cost for each additional construction season. The materials, labor, and equipment are subject to inflation between the construction seasons, and these costs must be increased to allow for inflation. A conservative estimate for annual inflation is ten percent, which should be applied to the cost of the remaining work. Some construction materials will be purchased directly from the manufacturer, and when such materials are ordered in large quantities, the unit cost is decreased. These construction materials may not be fully.installed during one construction season, and the cost to store the materials'for use the next year versus a higher unit cost for a smaller quantity must be corn-

TABLE 5-3

PRELIMINARY CONSTRUCITON COST ESTIMATE
FOR THE ENHANCEMENT PORTION OF THE PREFERRED ALTERNATIVE
BEAR VALLEY CREEK FISH HABITAT ENHANCEMENT PROJECT
(ENR 4200)

	Component	cost*
1.	Stabilization and Revegetation of Reach D	$ 543,00
2.	Stabilization and Revegetation of Reach E	405,00
3.	Stabilization and Revegetation of Reach G	131.00
4.	Stabilization and Revegetation of Adjacent Area GG	19,000
5.	Stabilization and Revegetation of Adjacent Area FF	102,000
6.	Minor Components	37,000
7.	Mobilization/Demobilization	41,000
	Subtotal	$ 1,278,OOO
	Contingencies @ '25%	320,000
	Special Construction Techniques @ 10%	128,000
	Subtotal	$ 1,726,OOO
	Engineering and Surveying**	154,000
	Legal and Adiminstration**	28,000
	Cosnttruction Management Services**	245,000
	TOTAL, PRELIMINARY COST ESTIMATE	$ 2,153,ooo

*All figures are rounded off to the nearest $1,000.
**See text for explanation of these costs.

pared. The engineering design work associated with the project will mostly be conducted prior to and during the first construction season. However, some engineering and surveying work will have to be undertaken in the second and any subsequent construction seasons. The need for additional engineering work may be greater than anticipated in subsequent construction seasons if the project site cannot be fully stabilized at the end of each construction season due to early winter conditions or an extremely wet spring, Changes in the scope 'of the project between phases of construction also may change the overall project cost.

There are many possible combinations of these and other factors which may influence the cost of a project because of phasing construction over several seasons. A hypothetical example of the effect of phasing construction of the preferred alternative is presented in Table 5-4. The annual funding available for construction of the enhancement portion of the project is assumed to be $500,000 in the example. Inflation is assumed to be 10 percent per year. Mobilization and demobilization costs are added each year and are assumed to inflate at 10 percent per year. The example presented in Table 5-4 indicates that given these assumptions, the phasing of construction could extend the construction over six years at a total estimated construction cost for enhancement of approximately $2,939,000.

CONSTRUCTION SCHEDULING

The construction schedule for the enhancement portion of the preferred alternative will be dependent upon how the project is phased and the funding available for each construction season. It will be essential to SCHEDULE construction activities such that the progress each season is maximized by using on-site equipment' as efficiently as possible. It will be equally important to schedule interim stabilization of each unfinished work area between the construction seasons.

The 1985 construction activities will begin in mid-July or August and extend through mid to late October. It is recommended that the most severe eroded: sections of stream reach D be stabilized during the 1985 season. The amount of construction on stream reach D which could be completed during the 1985 season, given an assumed level of funding at $500,000, is approximately 80 percent of the construciton ultimately planned for the reach. The stabilization whick could be accomplished in 1985 may-include floodplain excavation and construction, erosion control blanket and geotextile fabric installation, riprap placement, seeding, and some riparian revegetation on those portions of reach D with existing vertical streambanks. The material excavated from reach D in 1985 would be used to fill the flat area north of reach E. The fill material would be compacted and temporarily stabilized with stockpiled riprap and a mixture of annual grasses.

The construction scheduled for future years will be better defined following the design phase and the 1985 construction season. The phasing of the project may extend the period of construction for a number of years, and the construcition schedule must remain flexible to meet the most immediate needs of stabilizing and revegetating the patented land.

TABLE !&4

HYPOTHETICAL EXAMPLE
EFFECT OF CONSTRUCITON PHASING ON ENHANCEMENT PROJECT COST
BEAR VALLEY CREEK FISH HABlTAT ENHANCEMENT PROJECT

Construction Seasib	cost to Complete Construction ($)	Dollar Amount of Annual construction ($)	Unadjusted costa of Remaining Construction ($1	Inflation (10%) on Remaining Construction Costs[b] ($)	Mobilization & Demobilization Costs[c] ($)	Total Remaining Cost to Complete Construction[d] ($)
1985	2,153,000[e]	500,000	1,653,OOO	165,300	45,100	1,863,400
1986	1,863,400	500,000	1,363,400	135,300	49,600	1,549,300
1987	1,549,300	500,000	1,049;300	104,900	54,600	2,208,800
1988	1,208,800	500,000	708,800	70,900	60,100	839,800
1989	839,800	500,000	339,800	34,000	66,100	439,900
1990	439,900	439,900.	-O-		-O-	-O-
TOTAL		S 2,939,900f				

[a]Unadjusted cost does not include inflation on balance carried forward to next year or mobilization/demobilization costs.

[b]Inflation assumed to be 10% per year. This cost is carried forward to the next year.

CMobilization/Demobilization costs are inflated at 10% per year and carried forward to the next year.

[d]This cost is forwarded on to the next year as the cost to complete construction.

eENR Index Value = 4200. This cost includes mobilization & demobilization at $41,000 for the first construciton season.

[f]This total represents the total estimated construction cost of the enhancement portion of the project over the phased construciton period.

ESTIMATED CONSTRUCTION QUANTN'fES FOR STREAM CHANNEL REALIGNMENT

The construction quantities for the stream channel realignment portion of the preferred alternative were estimated in order to develop a preliminary cost for the project. These estimated construction quantities were made using information derived from 1) topographic maps of the study area (Bear Valley Minerals, Inc., 1985) with two foot contours at a horizontal scale of one inch equals 100 feet, and 2) USFS cross sections on the patented land. All quantities presented in this report are estimates which would be verified during design.

A number of assumptions have been made in order to develop the estimated construction quantities. Excavation volumes for construction of the floodplain in the stream channel realignment were developed using the cross sections shown in Figure 3-9. Cross sections were plotted every 200 feet along the stream channel realignment to help estimate excavation and fill quantities. The volumes for loading, hauling, compaction, grading and riprap were obtained from the one inch equals 100 feet (100 scale) topographic maps. Surface areas for stabilization and revegetation in the stream reaches and adjacent areas also were made using the 100 scale topographic maps. Preliminary sizing of the floodplain construction was accomplished using a hydraulic section method for open channel flow, from Chow (1959). Key assumptions for the hydraulic section calculations include: 1) floodplain boundary side slopes of 3 to 1; 2) stream channel gradients shown in the sections on Figure 3-l; 3) Manning's coefficient of friction estimated from 0.050; 4) floodplain channel width estimated at 180 feet to 240 feet; 5) peak streamflows estimated from the 1974 snowmelt runoff as modeled using, the HEC-1 computer model (Draft Feasibility Report, JMM, 1985); and 6) channel freeboard estimates made using recommended freeboard and height of bank guidelines from Chow (1959). The assumed floodplain widths will be verified during the design phase using the HEC-2 backwater profile computer model.

Geotextile fabric for stabilization of floodplain channel side slopes was assumed to extend to a depth of two feet below the stream channel invert and extend out five feet from the toe of the slope. The geotextile fabric also was assumed to extend three feet out from the top of the floodplain channel slope. Erosion control blankets for revegetation were assumed to cover the inboard banks and outboard areas associated with the floodplain. The geotertile fabric and erosion control blankets were assumed to be anchored with wood and/or wire stakes, placed at three foot centers. Riprap for anchoring the geotextile fabric at the toe of. the floodplain channel bank was assumed to extend to a depth two feet below the stream channel invert, and one foot above the depth of the design peak flow in the floodplain channel.

The estimated construction quantities for the stream channel realignment portion of the preferred alternative are presented by component in Table 5-5.~ These estimated construction quantities were calculated based upon the assumptions stated above.

TABLE 5-5

ESTIMATED QUANTITIES FOR CONSTRUCTION OF THE STREAM CHANNEL REALIGNMENT PORTION OF THE PREFERRED ALTERNATIVE

	Component	Unit	Value
1.	Stream Channel Realignment		
	General Excavation	cu yd	485,000
	Specialized Excavation	cu yd	15,000
	Loading and Hauling	cu yd	436,000
	Fill and Compaction	cu yd	425,000
	Grading and Leveling	cu yd	60,000
	Riprap	cu yd	12,000
	Geotextile Fabric	sq yd	51,000
	Erosion Control Blanket, Seeding, Fertilization	sq yd	79,000
	Riparian Vegetation	sq yd	20,000
	Floodplain Revegetation	sq yd	100,000
2.	Minor Components		
	Fencing	Mn ft	15,000

PRELIMIEARY COST ESTIMATE FOR STREAM CRANNEL REALIGNMENT

The preliminary cost estimate is based on preliminary estimates of quantities for the stream channel realignment component of the preferred alternative. Unit costs for materials, equipment, labor, and other items have been compiled from various sources including local contractors, manufacturers, other current construction projects in the-region, end the Means Site Work 'Cost Data 1985 and Building Construction Cost Data 1985 estimating manusls (meand, 1985. The preliminary cost estimates for the stream channel realignment portion of the preferred alternative represent feasibility level estimates. Estimates of costs for contingencies and special construction problemsare included. Costs for mobilization and demobilization, engineering and surveying, administration and legal services, and construction management have not been included for the stream channel realignment portion of the preferred alternative because Bear Valley Minerals, Inc. has indicated that they would finance the construction and possibly construct the new stream channel and floodplain using their in-house capabilities. Bear Valley Minerals, Inc. also has in-house capabilities in engineering and surveying, administration and legal services, and construction management, although the company has indicated that they could contract the work to engineering consultants.

Unit Costs for **Construction and Other Costs**

The unit costs presented in this report include material costs, construction equipment costs, labor costs, and contractor's/subcontractor's overhead and profit. All unit costs are established at mid-1985,levels and keyed to an Engineering News Record (ENR) construction cost index, value of 4200. The ENR index is based on an average construction cost for 20 selected cities in the U.S. and ma! be utilized to update the costs used in this report by comparing the ENR con struction index value to the mid-1985 index value of 4200. The ERR index ma 'be used to update the estimated costs of construction planned for the stream channel realignment. The unit costs for the various construction elements anti cipated for the Bear Valley Creek project are presented in Table 5-2. These uni costs are applied to the quantities listed in Table 5-5 to compute the estimate construction costs presented later in this chapter.

Other costs associated with the proposed construction are included as a percent age of the estimated preliminary construction cost as shown below.

- contingencies @ 25 percent of the total estimated construction cost
- special construction problems including wet excavation, site isola tion, logistical support, stream channel construction, weather, and mountain meadow environment @ 10 percent of the total estimate construction cost

Preliminary Constrnction Cost Estimate

The preliminary construction cost estimate is a feasibility level estimate which is approximate and computed without detailed engineering data or design. JM' typically assumes an accuracy of plus 50 percent and minus 30 percent for this level of preliminary cost estimate. The construction cost estimate for the stream channel realignment portion of the preferred alternative is summarized in Table 5-6. The construction, cost estimate is presented in terms of the re-alignment construction components of the preferred alternative. The preliminary construction cost estimate (ENR 4200) for the stream channel realignment portion **of** the preferred alternative is $.3,68&000.

CONSTRUCTION PHASING AND SCHEDULING FOR STREAM CHANNEL REALIGNMENT

The construction of the stream channel realignment portion of the preferred alternative would have to be phased over at least two years because of the limited construction season and revegetation constraints. The stream channel realignment portion of the preferred alternative would be financed by Bear Valley Minerals, Inc. Any increases in the construction cost of the stream channel realignment due to inflation during the period of construction would be borne by Bear Valley Minerals, Inc.

Construction scheduling for the stream channel realignment is primarily dependent on the permitting schedule established for this aspect of the project. Construction of the stream channel realignment in any normal runoff year could begin in mid-July or August and extend through mid to late October. Any construction activities extended from one year to the next year would require temporary stabilization over the ‘winter and spring months. Any temporary stabilization should be accounted ‘for in both construction phasing and construction scheduling.

SUMMARY

This chapter has provided estimated construciton quantities, a preliminary cost estimate, and discussions on phasing and scheduling of construciton, for the preferred alternative. The preferred alternative has a total preliminary estimated costs of approximately $2,15,3,000 for the enhancement and $5,682,000 for the stream channel realignment. Construction will have to be phased over a number of years, which will increase the overall cost of projects at completion, due to inflation. The 1985 construciton schedule includes enhancement and stabilization of the severely eroded portions of stream reach D.

TABLE 5-6

' PRELIMINARY CONSTRUCTION COST ESTIMATE FOR THE STREAM CHANNEL REALIGNMENT PORTION OF THE PREFERRED ALTERNATIVE BEAR VALLEY CREEK FISH HABlTAT ENHANCEMENT PROJECT (ENR 4200)

Construction Component	cost*
1. Stream Channel Realignment	
General Excavation	$ 1,213,OOO
Specialized Excavation**	56,000
Loading and Hauling	654,000
Fill and Compaction	638,000
Grading and Leveling	120,000
Riprap	660,000
Geotextile Fabric	357,000
Erosion Control Blanket, Seeding, Fertilization	150,000
Riparian Vegetation	200,000
Floodplain Revegetation	150,000
2. Minor Components	
Fencing	11,,000
Subtotal	$ 4,209,900
Contingencies @ 25%	1,052,OOO
Special Construction Problems @ 10%	421,000
TOTAL PRELIMNINARY CONSTRUCTION COST ESTIMATE* **	$ 5,682,OCIO

*All figures are rounded to the nearest $1,000.

**Dozer operation near existing stream channel.

***Does not include estimated costs for engineering and surveying, legal and,, administrative services, construction management services, or mobilization and demobilization.

CHAPTER 6

LIVESTOCK ACCESS PLAN

INTRODUCTION

This chapter presents a livestock access plan for the preferred alternative on the patented Iand in Bear Valley. Four types of fencing are ANALYZED in terms of construction effort, estimated cost, effectiveness, reliability, operations and maintenance requirements and costs, acceptability, and duration of service. A recommendation is made for the type of fencing best meeting the criteria listed above. Livestock crossings also are discussed in terms of these criteria. The potential effects of the preferred alternative on livestock access and utilization within the boundaries of the patented land are presented at the end of this chapter.

The fencing will be required as part v preferred alternative to protect the investment in stabilization materials and revegetation efforts. Livestock and wildlife which graze on the patented land will have to be excluded from the stabilized areas to allow the new vegetation to become established. It is ***im-*** portant to remember that the fence may only help control the livestock movement within the meadow but will not keep all animals out of the revegetated areas. The purpose of the fencing will be to discourage animal use of the stabilized areas.

The Big Meadows area is part of a three pasture rest-rotation systme. called the Bear Valley Allotment which is managed by the,USFS. The Big Meadows pasture provides approximately 1527 animal unit months (AUM%) out of a total ranging from 3089 AUM's to 3280 AVM's available for utilization when Big Meadows is in the grazing rotation. The rest0rotation system involves resting one pasture and grazing the other two pastures during any given year. The system is on a three year cycle, which means that during any three year period, a pasture will be grazed for two years and rested for one year. The USFS currently has three permittees which graze livestock in the Bear Valley Allotment,. These permittees are David Little, the MacGregor Land and Cattle Company, and Callendar & Beckman. The Big Meadows pasture is scheduled to be grazed in the early summer months of 1985 and the late summer months of 1986. A totl of 857 cattle grase on the Bear Valley Allotment each year between the three permittees, and the grazing season lasts from July 1 to October 1.5. The pastures are separated by fences which are maintained by the USFS.

The patented land is grazed by livestock when the Big Meadows pasture is in the grazing rotation. There are no fences separating the patented land from the National Forest System. land, and the livestock move freely throughout the Big Meadows pasture. The existing grazing operatrors utilize the patented lands in Bear Valley by permission from Bear Valley Minerals, Inc., which is the owner of the patented lands.

The area of the patented land proposed for fencing is shown in Figures 3-l and 3-9, and includes the eroding stream reaches, distrubed adjacent mine tailing and the stream channel realignment. The fencing would completely surround, the proposed improvements at a length of approximately 28,000 feet. The area to be enhanced is currently estimated to have a limited number of AUM's as compared to surrounding pasture land. Most of the enhancement portion of the project proposed to be fenced currently supports no significant vegetation. A majority of the stream channel realignment proposed for fencing is undisturbed meadow land which supports an established vegetative community. The revegetation efforts will be conducted to develop new vegetative communities in the destrubed areas which could eventually provide additional AUM's on the patented land. A brief analysis of the types of fencing which could 'be used to exclude livestock from the improved portions of the patented land is presented in the next section.

DESCRIPTION AND EVALUATION OF FENCING ALTERNATIVES

This section presents a description and evaluation of the fencing alternatives considered for excluding livestock from the improved areas on the patented land. The fencing alternatives are analyzed and evaluated in terms of various criteria developed for the project. These criteria include:

- Constructability
- Reliability and Effectiveness
- Acceptability
- Duration of Service
- Estimated Cost
- Operation and Maintenance Requirements and Costs

A recommendation for the type of fencing which should be used is made based on the evaluation.

There' are several' constraints which must be considered in the analysis of the fencing alternatives. The patented land in Bear Valley is remote and any fencing must have law operation and manintenance requiremnets. The area receives deep snowpacks during the winter months which exert heavy loads on fences. The meadow area is either wet or inundated during spring runoff. The existing vegetation may grow to a height of two feet in the undisturbed areas when the. pasture is in the rest cycle. The fence must have a duraiton of up to ten years which will allow the new vegetation to become established.

Description of Fence Types

Four types of fencing are considered in the analysis including: 1) New Zealand type electric fence:2) jackleg fences: 3) post and pole fences; and 4) layddwn barbed wire fence. The New Zealand type electric fence constists of three high tensile steel wires mounted on self-insulating solid fiberglass poles, and features high-powered energizers that send short-duration, high amperage impulses through the wires. The energizers can be adjusted to send from 11 random pulses up to 60 regulated pulses per minute, and may be powered by a 12-volt battery and solar cell recharge system. The jackleg fence is comprised of wooden poles stacked horizontally in a “zig-zag” pattern overlapping the pole ends. The post and pole type fence is constructed using wooden posts with the ends buried at least two feet deep and wooden poles attached horizontally between the posts. The laydown barbed wire fence **consists** of steel posts with the ends buried at least 30 inches deep and four strands of barbed wire attached to the posts using “Davison clips.” Wooden "dancer" poles are attached vertically to the barbed wire at 80 foot intervals, and the “Davison clips” are turned to release the wire from the steel posts in the fall, allowing the fence to be layed down over the winter. The “dancer” poles keep the barbed wires from becoming tangled after they are laid down in the fall. The wires are reinstalled each spring on the steel posts using the “Davison clips” after the snow melts away.

Evaluation of Fencing Alternatives

Each of these fences could be constructed to a height of four feet to exclude livestock from the revegetated areas. The performance of each fence is variable given the constraints discussed earlier. The four different types of fence are evaluated in the following subsections based on the criteria presented at the beginning of the previous section.

Constructability. The New Zealand type electric fence, and post and pole fence, each require a higher level of construction as compared to the other two types of fences. The electic fence involves constructing a system which not only repels livestock with impulses of electricity but also must accommodate winter snow loads. The electric fence system can be designed to provide flexibility fdr winter snow, however, such design features increase. the complexity of con-struction and the cost. The post and pole fence requires augering or digging of holes for setting the posts and attchigng the poles so the fence will remain intact over its period of service. This involves more construction per length of fence than the other three types of fences included in this evaluation: The jackbeg. fence is easily constructed in relatively flat areas suck as Big Meadows. The laydown barbed wire fence also involves simple construction. The steel posts are driven into the ground with a hand operated fence post driver and the wires are attached to the posts with the clips. The “Davison clips” require a special hand tool to attach the wire to the post. The laydown fence can be installed by two workers at a rate of 1300 feet per day.

Reliability and Effecitiveness. The four types of fences have varying degrees of reliability and effectiveness. The New Zealand type electric fence can be un-reliable because of grounding problems, wiht water and high growing vegetation. The electric fences are sometimes vandalized because the solar recharging sys; tern is an attractive item. Electric fences, can be ineffective if livestock have not been exposed to them, and some cattle will disregard electric shocks to get through the fence. Jackleg,, fences are generaly reliable, however, the high water may displace pieces of the fence as it becomes older. Jackleg fencing aslo may be affected by snow' loads. The jackleg, fence cannot be used in the flood: plain or crossing the stream, because it will eventually fail if debris piles up against the side of the fence during high water. Jackleg fences are mostly effective in controlling livestock, however, cattle can sometimes push the fencing over ,by rubbing against weak sections. Post 'and pole fencing is generally reliable, however, the wet meadow conditions of the patented laud may cause the fence posts to rot in several years. The fence posts can be treated~before installation, but the treatment may only extend their life by several years. Post and pole fences cannot be used in the floodplain or crossing the stream because of debris pileup during high water. The post and pole fences are effective for excluding livestock unless a pole breaks and' allows cattle entry to the re-vegetated area. The laydown barbed wire fence is the most reliable because it is not-affected by snow loads, the steel posts will not be affected by wet meadow conditions, and it can be used in the floodplain and across the stream. The barbed wire can rust over time, however, it generally lasts longer than ten years. The laydown fence is expected to have good effectiveness for excluding livestock as barbed wire is used in range areas throughout the region (Don Justus, personal communication, 1985). .

Acceptability. The four types of fences have different levels of acceptability among grazing operators and range managers. The New Zealand type electric Fence is not widely used and relatively new to the Northwest. The post and pole fence and jackleg fence are aesthetically pleasing and used throughout portions of Idaho. The laydown barbed wire fence appears to be acceptabel` to both grazing operators and range managers in areas where heavy snows accumulate during the winter months (Justus, personal communication, 198'5; Kriz, personal communication, 1985). The Big Meadows area is used extensively for winter recreation and snowmobiling. The fences may restrict snomobiling in a portion of the patented land until snow dephs are great enough to cover the fences.

Duration of Service. The four fencing alternatives would probably have different durations of service because of the environmental conditions in Bear Valley. The electric fence could be expected to last 'ten years, however, this more complex fencing system has more parts that can fail or be put out of service. The jackleg fence is generally expected to have a duration of sevice ecceeding ten years, The post and pole fence may not last ten years because of the potential for the posts to rot in the wet soil. The laydown barbed wire fence has a duration of service which exceeds ten years.

Estimated Cost. The estimated costs of the, four fencing alternatives are made based on April 1985 unit prices for a four foot high fence installed in Bear Valley. These estimated costs include materials, equipment, and labor for construction of the fences. Operation and maintenance costs sre not included in the estimated cost. The total length of the fence is assumed to be 28,000 feet for each alternative, and includes four stream crossings. The unit costs. and total estimated cost for each alternative is presented in Table 6-1. The laydown barbed wire fence has the lowest total estimated cost.

Operation and Maintenance Requirements and Costs. The fencing alternatives have different operation and maintenance requrements and costs. The New Zealand type electric fence has to be checked regularly to insure proper operation and that the system is not grounding out. The manufacturers recommend clearing, grass and other vegetation along the fence line regularly to help prevent grounding of the electrical system. The electric fence is maintenance intensive

TABLE 6-l

ESTIMATED COSTS FOR FENCING ALTERNATIVES
BEAR VALLEY CREEK FISH HABITAT ENHANCEMENT PROJECT

Fencing Alternative	unit Cost($)	unit	Estimate cost ($)*
New Zealand Type Electric	1.50	lin ft	42,oc
Jackleg	4.00	lin ft	112,oc
Post and Pole	4.00	lin ft	112.00
Laydown Barbed Wire	0.75	lin ft	21,001

*Based on total length of 28,000 feet of fencing for the Preferred alternative The enhcncement portion of the preferred alternative will require 13,000 feet c fence. The remaining 15,000 feet of fence would surround the stream channel realignment portion of the preferred alternative.

and would probably require a total of four man-weeks per year, in addition to any repairs which have to be made. The estimated cost of annual operation and maintenance for the N,ew Zealand type electric fence is approximately $3,000 $4,000 (June 1985 dollars). The jackleg fence and post and pole fence both have very low operation requirements. The post and pole fence has potentially moderate maintenance requirements and costs if the wooden posts rot because of the wet soils. It is difficult to estimate an annual cost for maintenance of the post and pole fence and jackleg fence, however, a figure of four man-days at $800.'per average year (June I985 dollars) may be assumed for checking and repair of each type of fence. The, laydown barbed wire fence has relatively low operation and maintenance requirements and costs. The fence is laid down in the fall which would require a two man crew for one half day. The fence is put up in the spring. following the peak of the runoff and would require a two man crew one half day to complete the job. An additional half'day would be spent making minor repairs when the fence is put up in the spring. The total annual operation and maintenance requirements would be three man days at $1,200 - $2,000 per year (June 1985 dollars) including miscellaneous parts for repair end labor.

Recommended Fencing Alternative

The recommended fencing alternative for enclosing the improved areas on the patented land in Beer Valley is the laydown barbed wire fence. This fencing, alternative is easily constructable, reliable effective, generally acceptable, will provide over ten years of service, and has the lowest estimated cost of the four types of fence evaluated. The laydown barbed wire fence has low to moderate operation and maintenance requirements and costs. The fence must be laid down in the fall and put back up in the spring each year. The use of "Davison clips" in the laydown fence reduces the operation and maintenance time required during the spring and fall. The laydown fence also can be easily phased with the construction of the preferred alternative. Extension of the fence around areas improved during the second and subsequent years of construction can be easily accomplished.

LIVESTOCK CROSSINGS

There are no anticipated livestock crossings to be constructed as part of the improvements planned for the patented land in Bear Valley. The fencing will not extend across the road at. the bridge in Section 15, but would be constructed parallel to the upstream side of the road and bridge. This will allow for movement of livestock across the bridge and not require installation of cattle guards in the roadway. The livestock will be restricted from crossing the stream by the fence enclosing the improved reaches, but animals may still cross the stream unimpeded downstream of the bridge in Section 15 and upstream of reach D.

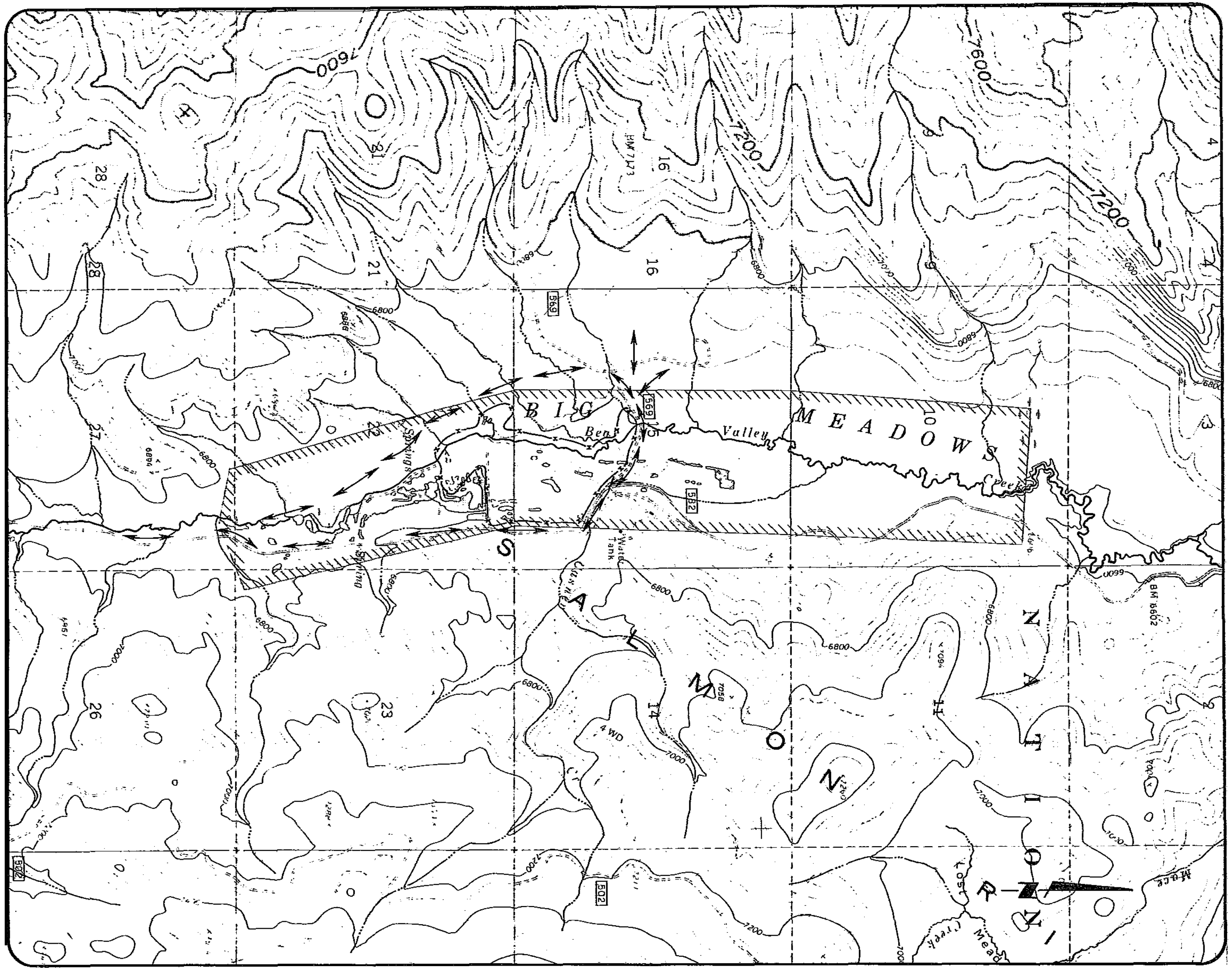
EFFECTS OF PREFERRED ALTERNATIVE AND RECOMMENDED FENCING ON LIVESTOCK

The preferred alternative end the recommended fence enclosing the improvements will have minor effects on existing livestock operations and access in the Big Meadows area of Bear Valley. The fencing will be located entirely on patented land, and will enclose areas in the enhancement portion of the project presently producing limited or no vegetation. The main road through the patented land is sometimes used to drive cattle to and from Big Meadows and the small meadow areas south of the patented land. A secondary livestock access route to the west of Bear Valley Creek is apparent in low level photographs of the area (EPA, 1984). Both of these accass routes are shown in Figure 6-l along with the proposed fencing around the preferred alternative. One effect of, the fencing on livestock will be an exclusion of the animals from the west side of Sear Valley Creek south of the bridge in Section 15.

The preferred alternative could have beneficial long term effects on the livestock after the new vegetation becomes established in the stream reaches and adjacent areas. The fencing will probably be left in place for ten years, and then it may be removed depending on the success of the revegetation efforts.

SUMMARY

This chapter has described and evaluated four alternatives for fencing around the: preferred alternative on the patented land in Bear Valley, and has provided a recommended fencing alternative which would have only minor effects on current and future livestock access routes and operations. The laydown barbed wire, fence is recommended based upon evaluation of various criteria established for the project. The fence will he maintained for at least ten years in order to helps promote revegetation of the most severly disturbed areas on the patented land.



BEAR VALLEY CREEK FISH HABITAT ENHANCEMENT PROJECT

FIGURE 6-l

LIVESTOCK ACCESS ROUTES

LEGEND

PROPOSED FENCING ABOUND THE SELECTED ALTERNATIVE

EXISTING LIVESTOCK ACCESS ROUTES

PATENTED LAND BOUNDARY

0 1000 2000 4000
SCALE FEET

JAMES M. MONTGOMERY, CONSULTING ENGINEERS, INC.

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FINAL REPORT

BIOLOGICAL EVALUATION
OF THE
NORTHERN ROCKY MOUNTAIN GRAY WOLF
FOR THE
BEAR VALLEY CREEK
FISH HABITAT ENHANCEMENT PROJECT

Prepared for

THE SHOSHONE-BANNOCK TRIBES

By

Brian D. Liming
James M. Montgomery, Consnlting Engineers, Inc.

JAMES M. MONTGOMERY, CONSULTING ENGINEERS, INC.

1301 Vista Avenue Argonaut Building, Suite 210, Boise, Idaho 33705 / (208) 345-5865

713.0042

October 29, 1985

Shoshone-Bannock Tribes
P. 0. Box 306
Fort Hall, ID 83203

Attention: Dr. Richard C. Konopacky, Project Manager

Subject: Bonneville Power Administration Contract No. 83-359
Final Report, Biological Evaluation of the Northern Rocky
Mountain Gray Wolf for the Bear Valley Creek Fish
Habitat Enhancement Project

Gentlemen:

We are pleased to submit two copies of the Final Report, Biological Evaluation of the Northern Rocky Mountain Gray Wolf for the Bear Valley Creek Fish Habitat Enhancement Project. This report was prepared under Contract Amendment No. 2 to our August 27, 1984 agreement. At your instruction, we have mailed copies of this draft report to Larry Everson and Kevin Ward representing the Bonneville Power Administration (BPA).

The Draft Report (dated August 21, 1985) was provided to the U.S. Fish and Wildlife Service, the Lowman Ranger District - Boise National Forest, BPA, and Bear Valley Minerals, Inc. Only the U.S. Fish and Wildlife Services responded in witting (see Appendix A). The U.S. Forest Service Boise National Forest and Bear Valley Minerals, Inc. both made several minor editorial comments by telephone that have been incorporated in the Final Report.

We appreciate the assistance and cooperation provided to JMM by all of the agencies involved in the overall project. If you have any questions, please call me at (208) 345-5865.

Very truly yours,

Brian D. Liming

Brian D. Liming
Project Engineer/Scientist

Enclosure

Abstract: The proposed Bear Valley Creek Fish Habitat Enhancement Project is located on private land surrounded by the Boise National Forest near then, headwaters of Bear Valley Creek. The project area includes potential key wolf habitat components that could be important during the spring season. Historical wolf sightings within and surrounding an "area of project influence" on potential, wolf activity are reviewed in this report, and limited data on the prey base are provided. The potential project effects on wolves are discussed along with the welfare of the wolf prey base. The potential for direct wolf mortality due to wolf-human encounters also is addressed. Possible cumulative effects on the wolf from other area activities in combination with the proposed project are noted; Potential mitigation measures are discussed including delay of the construction activity until after July 15, construction personnel transportation, hunter education, and general education of project personnel on the gray wolf and current recovery efforts. The report concludes that the proposed project will, not endanger the continued existence of the wolf, and that a "no-effect" decision is justified.

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FINAL REPORT

BIOLOGICAL EVALUATION OF THE NORTHERN ROCKY MOUNTAIN GRAY WOLF FOR THE BEAR VALLEY CREEK FISH HABITAT ENHANCEMENT PROJECT

INTRODUCTION

The Northern Rocky Mountain Gray Wolf (Canis lupus irremotus) is currently classified as an Endangered Species under the Endangered Species Act of 1973, and Amendments of 1982. Wolves have been sighted on the Boise National Forest since 1905 and current records indicate low wolf densities (Kaminski and Boss, 1981). Most observations of wolves or, wolf sign involve lone individuals. Occasional pairs of wolves have been sighted, however, groups of three or more individuals have been rarely sighted. Wolf sightings and/or evidence of wolf activity in Idaho have been rated as “possible” or “probable” by researchers with the U.S. Forest Service (USFS) and U.S. Fish, and Wildlife Service (USFWS) (Kaminski and Boss, 1981) (J. Hansen, personal communication, 1985). Current records indicate one confirmed wolf sighting on the Boise National Forest, Low-man Ranger District, near Deadwood Reservoir in 1978 when a hunter shot and killed a gray wolf. Subsequent investigations in the Bear Valley-Warm Lake area and vicinity have led researchers to estimate that the present wolf population on the Boise National Forest consists of four to nine individuals, based on reported observations from 1978 to 1980 (Kaminski and Boss, 1981). These individuals may be scattered seasonally throughout adjacent National Forest and wilderness ***lands.***

Records of wolf observations provide an indication of wolf activity throughout the central Idaho area These records have aided resource managers and wolf researchers in identifying and selecting gray wolf recovery areas. The Northern

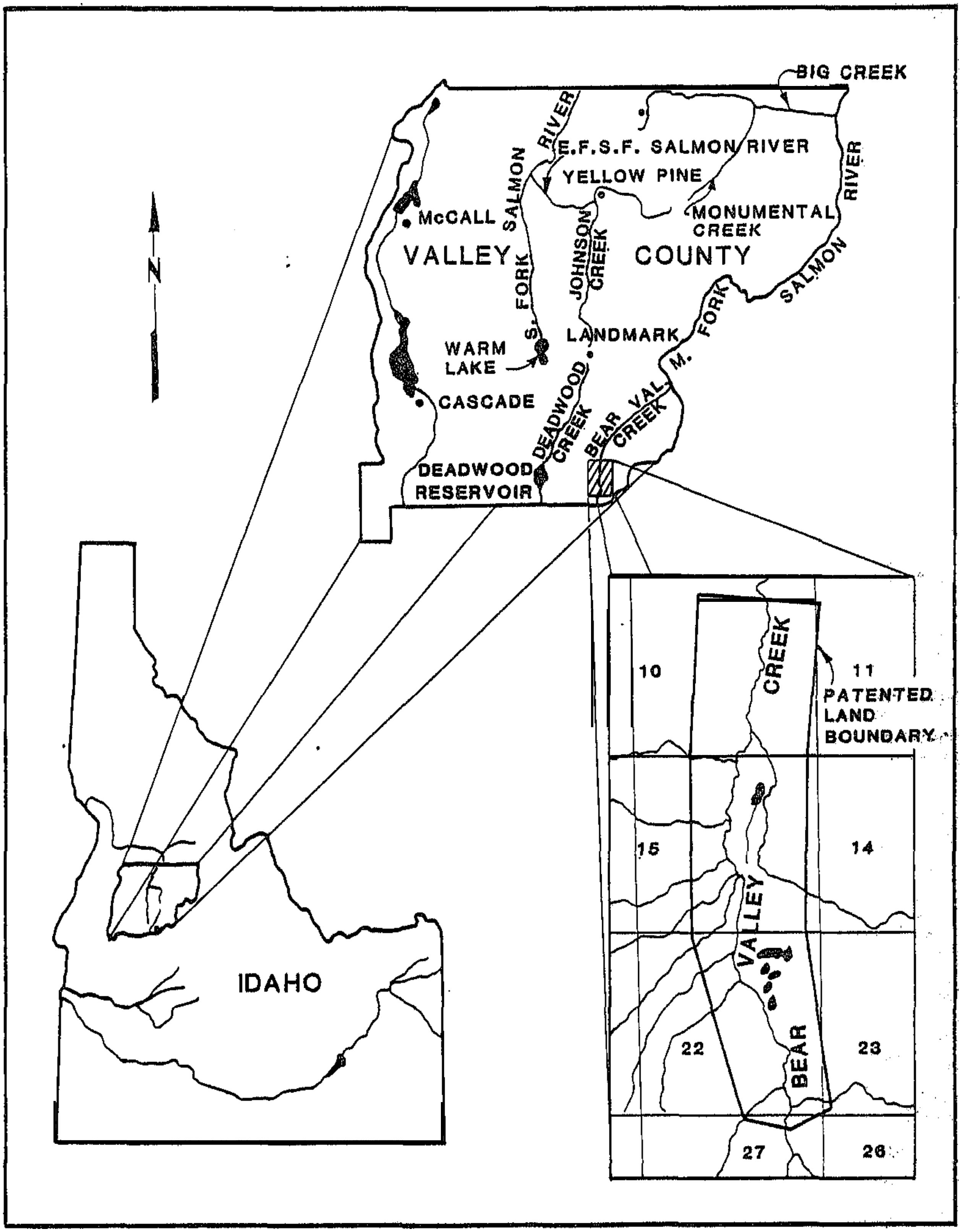
Rocky Mountain Wolf Recovery Team has selected the Frank Church River of No Return Wilderness as part of the central Idaho area for recovery of the gray wolf. The recovery team is currently refining wolf management guidelines for the recovery area.

The objective of this biological evaluation is to determine if there will be any positive or negative effects on the wolf or its habitat as a result of the Bear Valley Creek Fish Habitat Enhancement Project. The two major concerns with regard to the proposed project and the wolf are: 1) the welfare of the wolf prey base; and 2) the potential for direct wolf mortality due to human-wolf encounters.

DESCRIPTION OF THE PROPOSED PROJECT

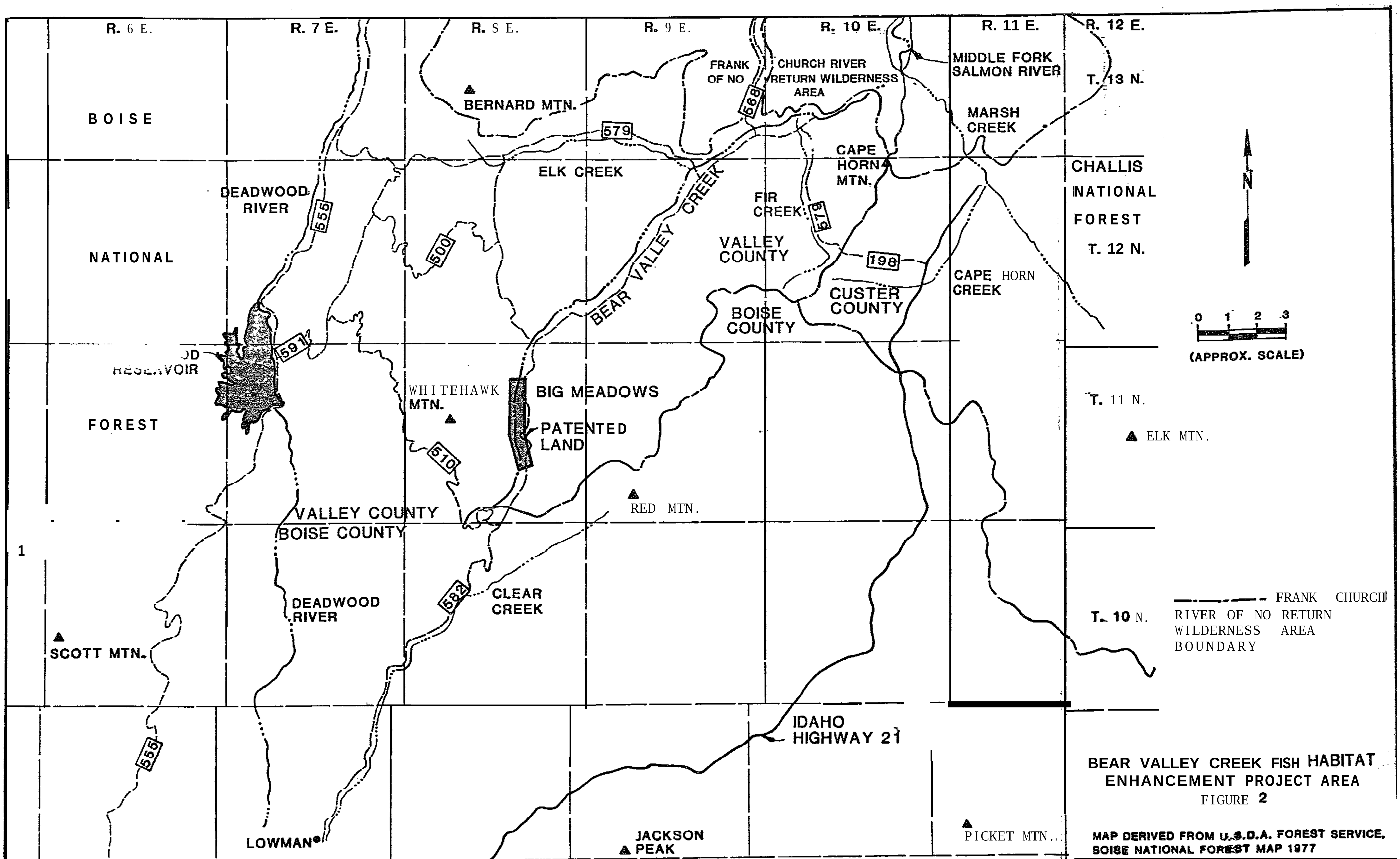
The proposed Bear Valley Creek Fish Habitat Enhancement Project is located in southeast Valley County, Idaho (Figure 1). The project area is situated in the Big Meadows area of the Bear Valley Creek drainage (Figure 2). Bear Valley Creek, a major tributary of the Middle Fork of the Salmon River, is a spawning, and rearing stream for wild stocks of anadromous fish. The proposed project is sponsored by the Shoshone-Bannock. Tribes (Tribes) and funded by the Bonneville, Power Administration (BPA) under contract number 83-359 as part of the Salmen River Habitat Enhancement Program. The intent of the project is to provide offsite enhancement as partial compensation for fish habitat damage and migration problems related to hydroelectric power projects in the Columbia River Basin. The project will involve construction on a portion of the 910 acres of private, patented land owned by Bear Valley Minerals, Inc. The proposed project is located 9.5 miles south of the Frank Church River of No Return Wilderness.

During the period from 1954 to 1959 the presently patented (privately owned) land (Figures 1 and 2) in Big Meadows was dredge mined for the strategic minerals columbite and euxenite. The past mining operation incorporated reclamation methods appropriate to the technology of the times, however, the site has increasingly become a chronic problem area as a result of these earlier



BEAR VALLEY CREEK
FISH HABITAT ENHANCEMENT PROJECT
LOCATION MAP

FIGURE 1



BEAR VALLEY CREEK FISH HABITAT ENHANCEMENT PROJECT AREA

FIGURE 2

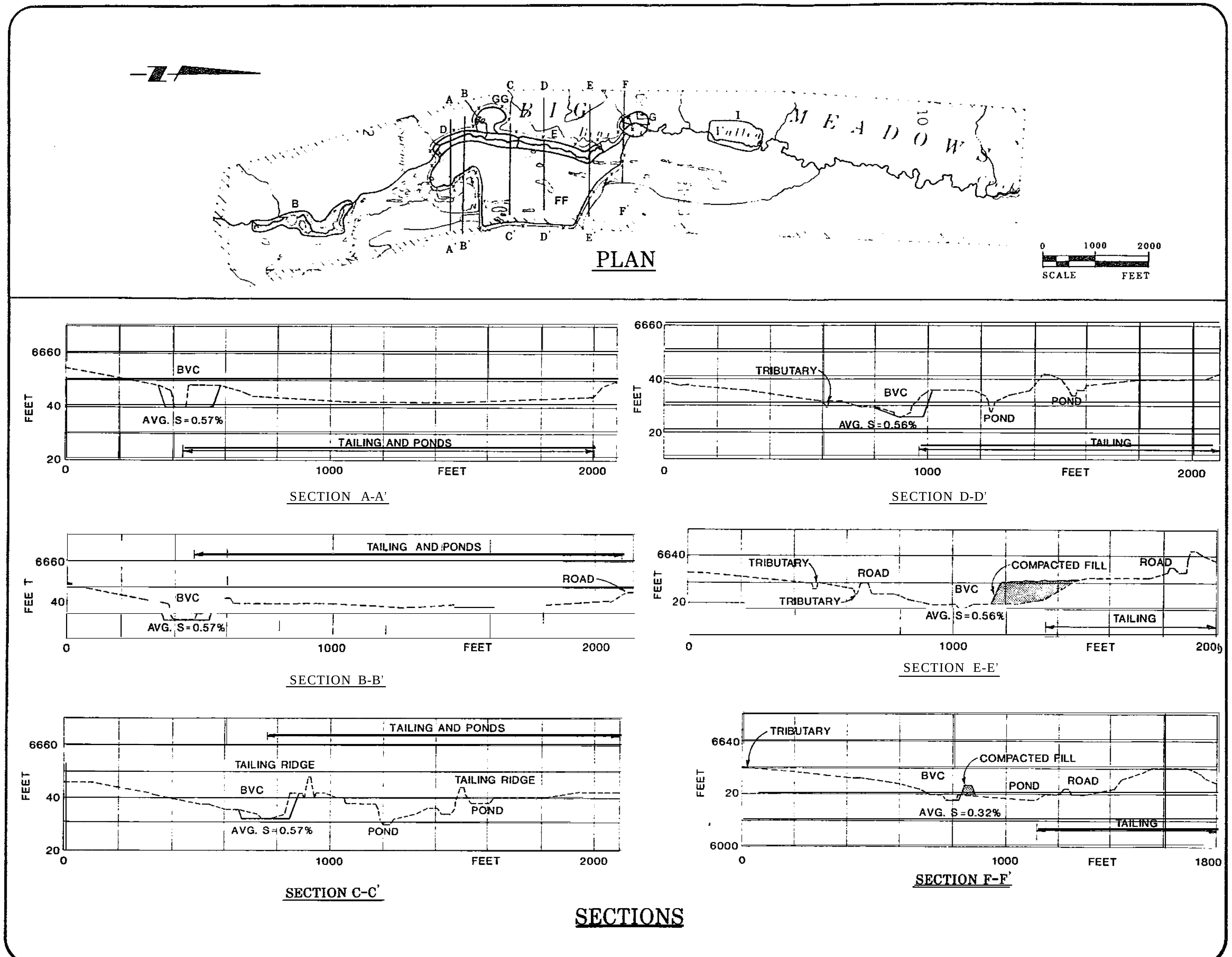
MAP DERIVED FROM U.S.D.A. FOREST SERVICE, BOISE NATIONAL FOREST MAP 1977

activities. During the past 26 years, the stream has eroded the dredge tailing and undisturbed placer material vertically and horizontally, resulting in the generation of substantial quantities of sediment which subsequently were transported to downstream reaches. The sedimentation has contributed to a reduction of spawning and other critical habitat areas for chinook salmon. The overall purpose of the project is to reduce the erosion and sedimentation and enhance the fish habitat.

The project feasibility study (JMM, 1985) was started in October 1984 and included preliminary field reconnaissance. The feasibility study resulted in selection of a project alternative which is conceptually agreeable to all involved agencies and Bear Valley Minerals, Inc. Additional field studies have been conducted during spring and summer 1985 to verify assumptions made in the feasibility study and help plan for construction of the habitat enhancement project. These field studies include water quality monitoring, streamflow measurement, vegetative community analyses, soil sampling, stream cross section surveying, and general field/photographic reconnaissance.

The'proposed project consists of constructing a floodplain and stabilizing slopes along Bear Valley Creek throughout a portion of the previously dredge mined area (Figure 3). The floodplain construction will involve excavating approximately 80,000 cubic yards of sand, sediments, and small rocks along the existing stream channel to provide enough capacity for high spring snowmelt runoff flows and protect the banks from erosion. The streambank and floodplain stabilization and revegetation are schematically shown in section (Figure 4) and plan (Figure 5). The low flow channel of Bear Valley Creek will not be altered as part of this project. The entire project area delineated in the plan portion of Figure 3 will utlimately be fenced to exclude livestock from the stabilized areas and protect the overall investment in the fish habitat enhancement project.

Construction on the project will be phased over several years due to funding limits, the short construction season, high spring runoff flows. and potential early season wildlife use of the Big Meadows area. The construction planned for



BEAR VALLEY CREEK FISH HABITAT ENHANCEMENT PROJECT

FIGURE 3

CONCEPTUAL PROJECT PLAN AND SECTIONS

LEGEND

PLAN

PATENTED LAND BOUNDARY

D — STABILIZATION AND REVEGETATION OF STREAM REACHES

GG — STABILIZATION AND REVEGETATION OF ADJACENT AREAS

I — STREAM REACHES TO RECEIVE FURTHER STUDY IN THE FIELD

E–E' — CROSS SECTION LOCATIONS

PROPOSED FENCING

SECTIONS

PROPOSED CONSTRUCTED FLOODPLAI

EXISTING CROSS SECTIONS

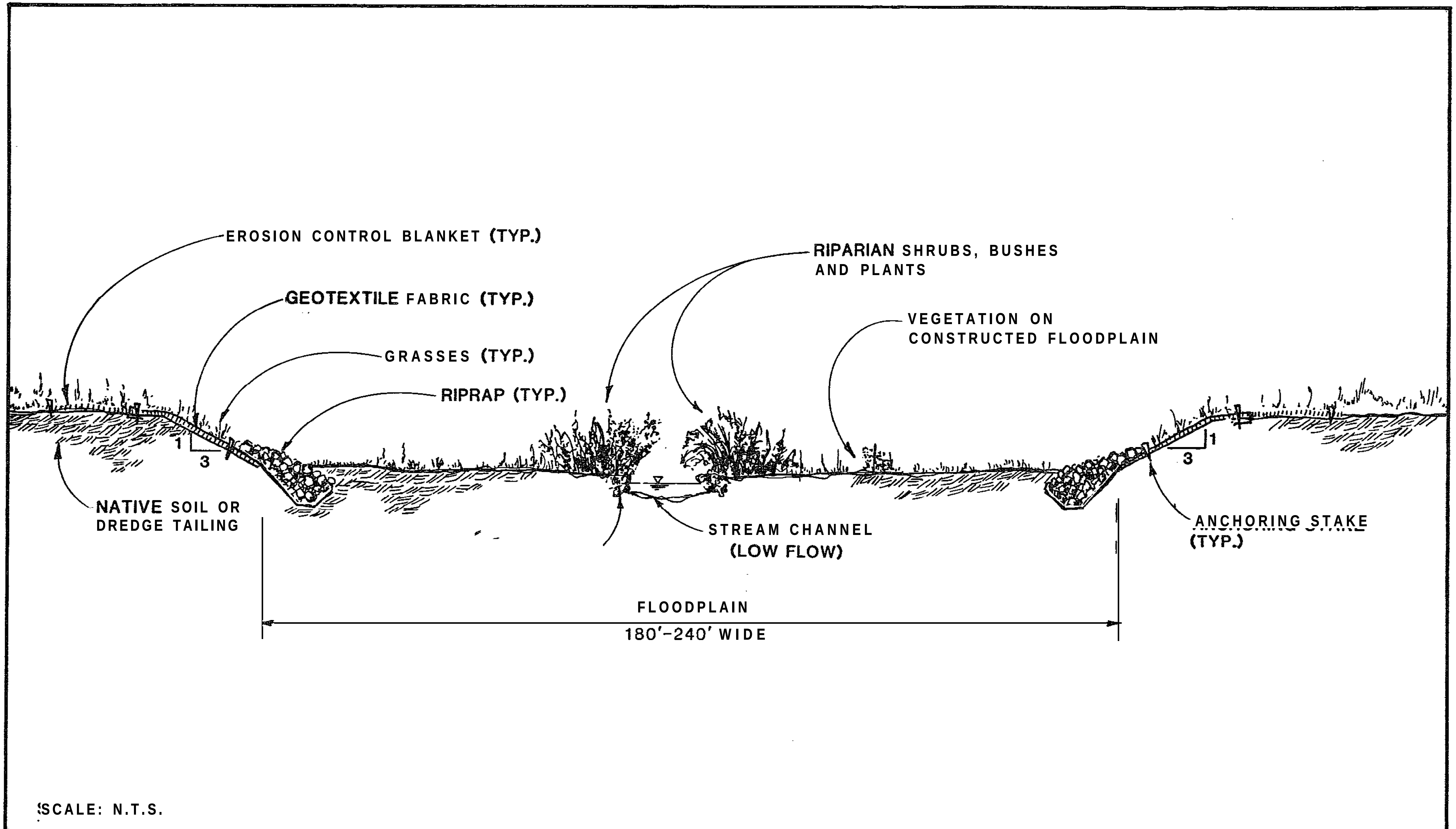
AVG. S — AVERAGE SLOPE

BVC — BEAR VALLEY CREEK

COMPACTED FILL

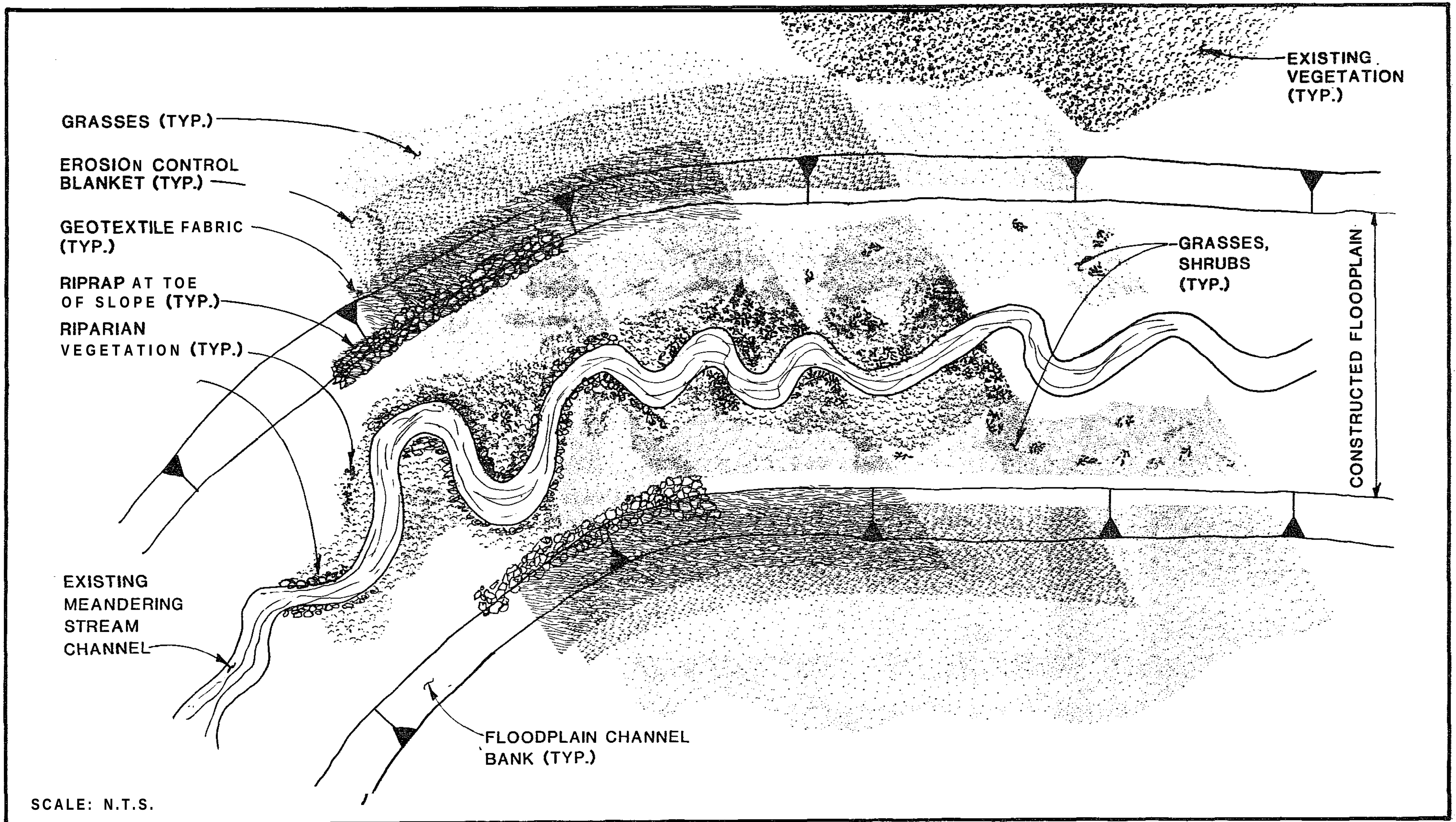
NOTE: ALL CHANNEL SIDE SLOPES ARE 3:1. CROSS SECTION SCALE IS 10 TO 1 VERTICAL EXAGGERATION.

JAMES M. MONTGOMERY, CONSULTING ENGINEERS, INC.



SCHEMATIC SECTION OF STREAMBANK STABILIZATION AND CONSTRUCTED FLOODPLAIN

FIGURE 4



SCHEMATIC PLAN OF STREAMBANK STABILIZATION AND CONSTRUCTED FLOODPLAIN

FIGURE 5

1985 will begin in September and continue until the end of October. Construction during future years would begin in mid-July and end in mid to late October.

The proposed project will require a maximum work force of 20 persons during the height of construction activity. The work force will be housed in the Lowman, Idaho area which is approximately 17 road miles from the project construction site. Road access from Lowman to the project site will involve the use of Forest Route 582. A portable house trailer will be located at the project site to provide temporary housing for a night watchman (if necessary). The trailer will be removed from Bear Valley at the close of each construction season during'the contractor's demobilization period.

The general contractor for the proposed construction project will be James M. Montgomery, Consulting Engineers, Inc. (JMM). JMM will hire construction subcontractors for each portion of the project. The subcontractors will work under the direction and supervision of JMM. A JMM construction supervisor will work in the field on a full time basis during each construction season.

BIOLOGICAL DATA ANALYSIS – WOLF AND PREY BASE

Historical Reports of Wolves in the Bear Valley Creek Area

The Northern Rocky Mountain gray wolf occurred historically throughout the entire state of Idaho, the northwestern two-thirds of Montana, the northern two-thirds of Wyoming. and the southern third of Alberta (Goldman. 1944). The Bear Valley-Warm Lake area contains the majority of probable wolf reports on the Boise National Forest (Kaminski and Hansen, 1984). There are several recent reports of wolves in the immediate project area and near the dredge ponds.

Reported wolf sightings in the Bear Valley Creek area are summarized in Table 1. The locations of these sightings are shown on Figure 6. Many of the sightings shown in Figure 6 are within the "area of project influence" on potential wolf activity.

TABLE 1

WOLF SIGHTINGS IN THE VICINITY OF BEAR VALLEY CREEK FISH HABITAT ENHANCEMENT PROJECT AREA

Date*	Legal Description	Location	Rating
Feb. 1923**	T.l2N., R.7E., Sec. 28	Near Mary Blue Mine north of Deadwood Reservoir, mid-winter	Probable Sighting
June-Oct. 1931	T.12N., R.6E., Sec. 30	Peace Valley between Peace Creek and Silver Creek	Probable Pair Sighting
1941	T.9N., R.llE., Sec. 21	North Fork Boise River near Picket Mountain	Probable Trapped 1 male and 1 female
June 1947	T.l3N., R.8E.. Sec. 1.2, 11,12	Near Elk Meadow	Probable Sighting
June 1947	T.l3N., R.8E., Sec. 13,14, 23,24	Near Elk Meadows	Probable Sighting
Oct. 1952	T.9N., R.lOE. Sec. 24	Wapiti Creek near Grandjean	Probable Sighting
Fall 1955	T.l3N., R.8E.	Near Deadwood Ridge	Probable Sighting
Fall 1957**	T.12N., R.8E., Sec. 6	In meadow near Deer Creek	Probable Sighting
Aug. 1961	T.l3N., R.8E.. Sec. 13	Junction of Porter Creek and North Fork Elk Creek	Probable Sighting
July 1963**	T.l3N., R.lOE., Sec. 31	Bruce Meadows	Probable Sighting
Oct. 1963**	T.l3N., R.8E., Sec. 35	Near Elk Creek and Twin Bridges	Probable Sighting
Oct. 1963**	T.12.N., R.8E., Sec. 4	Wet meadows near Elk Creek Road	Probable Sighting and Howling
Fall 1965-66	T.10N., R.llE., Sec. 35 or 36	In Trail Creek Draw near Grandjean	Probable Wolf Chasing Cow Elk
Oct. 1967**	T.l3N., R.lOE., Sec. 31	Bruce Meadows	Probable Sighting
Fall 1967-68	T.lON., R.6E., Sec. 19	Near Scott Mountain	Probable Sighting
Aug. 1968-69	T.lON., R.6E., Sec. 35	On Pine Creek Road to Scott Mountain	Possible Sighting

TABLE 1 (CONT.)

Date*	Legal Description	Location	Rating
July 1970**	T.l3N., R.8E., Sec. 28	Little Beaver Creek Meadow	Probable Sighting
July 1971**	t.12n., r.8e., Sec. 16	Near Elk Trap Meadow and Bearskin Creek	Probable Sighting
Sept. 1971**	t.12n., R.8E., Sec. 4,9	Bearskin Road near Elk Trap Meadow	Probable Sighting
Summer **1972****	t.12n., R.8E., Sec. 5	Wet Meadows near South Fork Deer Creek	Probable Sightisg
July-Aug. 1973**	T.12N., R.8E., Sec. 4	Near confluence of Wet Meadows and Bearskin Creek	Probable Sighting
July 1974**	T.22N., R.8E., Sec. 2	North end of Big Meadows in Bear Valley	Probable Sighting
Aug. 1974* *	T.l2N., R.9E., Sec. 17	l/2 mile north of Sack Creek	Possible Sighting
Summer **1975****	T.12N., R.8E., Sec. 28	Meadows at south end of Bearskin Creek	Probable Sighting
Aug. 1976	T.l3N., R.8E., Sec. 3,4	West Fork Elk Creek Meadow Chain	Probable Sighting
Fall 1976* *	T.l3N., R.10E., Sec. 26,27	Bruce Meadows	Probable Sighting
Fall 1976**	T.l3N., R.20E., Sec. 31	Bruce Meadows	Probable Sighting
Oct. 1976	T.11N., R.7E., Sec. 17	Southeast of Deadwood Reservoir l/2 mile from airstrip	Probable Sighting
197a**	T.12N., R.8E.	Sheep Trail Creek	Probable Sighting
1978**	T.13N., R.8E., Sec. 34	Near Cow Camp	Probable Sighting
April 1978	T.10N., R.6E., Sec. 4	Near Packsaddle Creek	Probable Sighting
June 1978**	T.llN., R.8E., Sec. 15	Near dredge ponds in Bear Valley	Probable Sighting
Sept. 1978**	T.l3N., R.9E., Sec. 3	Near Portland Mine Meadows	Possible Sighting
Fall 1978**	T.l2N., R.9E., Sec. 16	Crossed road in front of pickup	Probable Sighting
Oct. 1978**	T.12N., R.8E., Sec. 18	Near South Fork Deer Creek; Bear Valley	Confirmed Male Wolf Shot/Killed

TABLE 1 (CONT.)

Date*	Legal Description	Location	Rating
Apr. 1979	T.9N., R.7E., Sec. 34	Near Lowman	Possible Sighting
Aug. 1979**	T.12N., R.8E., Sec. 35	Junction of Bear Valley Creek and Cub Creek	Possible Sighting
Aug.1979**	T.l2N., R.8E., Sec. 35,36	Near junction of Bear Valley Creek and Cub Creek	Possible Pup Sighting
Oct.1979**	T.12N., R.8E., Sec. 10	In Bear Valley near Bearskin Creek	Probable Sighting
Oct. 1979**	T.12N., R.8E., Sec. 10	Near Bearskin Creek	Possible Sighting
Apr. 1980	T.9N., R.7E., Sec. 36	Near Lowman	Possible Sighting
May 1980	T.llN., R.12E.	Near Lowman-Stanley Road	Possible Sighting
June 1980**	T.l3N., R.9E., Sec. 26,27	North side Poker Meadows	Probable Sighting
June 1980**	T.l3N., R.9E., Sec. 26,27	Grassy meadow on southeast end of Poker Meadow	Probable Sighting
June 1980**	T.13N.. R.9E., Sec. 26,27	In meadows between Tennessee Creek and Poker Meadows	Probable Sighting
July 1980**	T.l3N., R.9E., Sec. 26,27	Between Tennessee Creek and Poker Meadows	Possible Sighting
July 1980**	T.l3N., R.8E., Sec. 35	Near Twin Bridges Elk Creek	Possible Sighting
Sept. 1980**	T.l2N., R.8E., Sec. 21	Bearskin Creek	Possible Sighting, Scat
Sept. 1980**	T.lZN., R.8E., Sec. 22	Bearskin Road, Bear Valley	Possible Sighting
Sept. 1980**	T.12N., R.8E., Sec. 9	Near confluence of Willow Creek and Crooked River	Possible Sighting
Oct. 1980	T.l3N., R.10E., Sec. 6	North of Ayers Meadow near Dagger Creek	Possible Sighting
Oct. 1980**	T.l3N., R.9E., Sec. 14,15, 22,23	Near Poker Meadows	Probable Sighting
Oct. 1980	T.llN., R.12E., Sec. 22	Near Dry Creek in Stanley Basin	Probable Sighting
Oct.1980**	T.l2N., R.9E., Sec. 20	Near Sack Creek	Probable Sighting

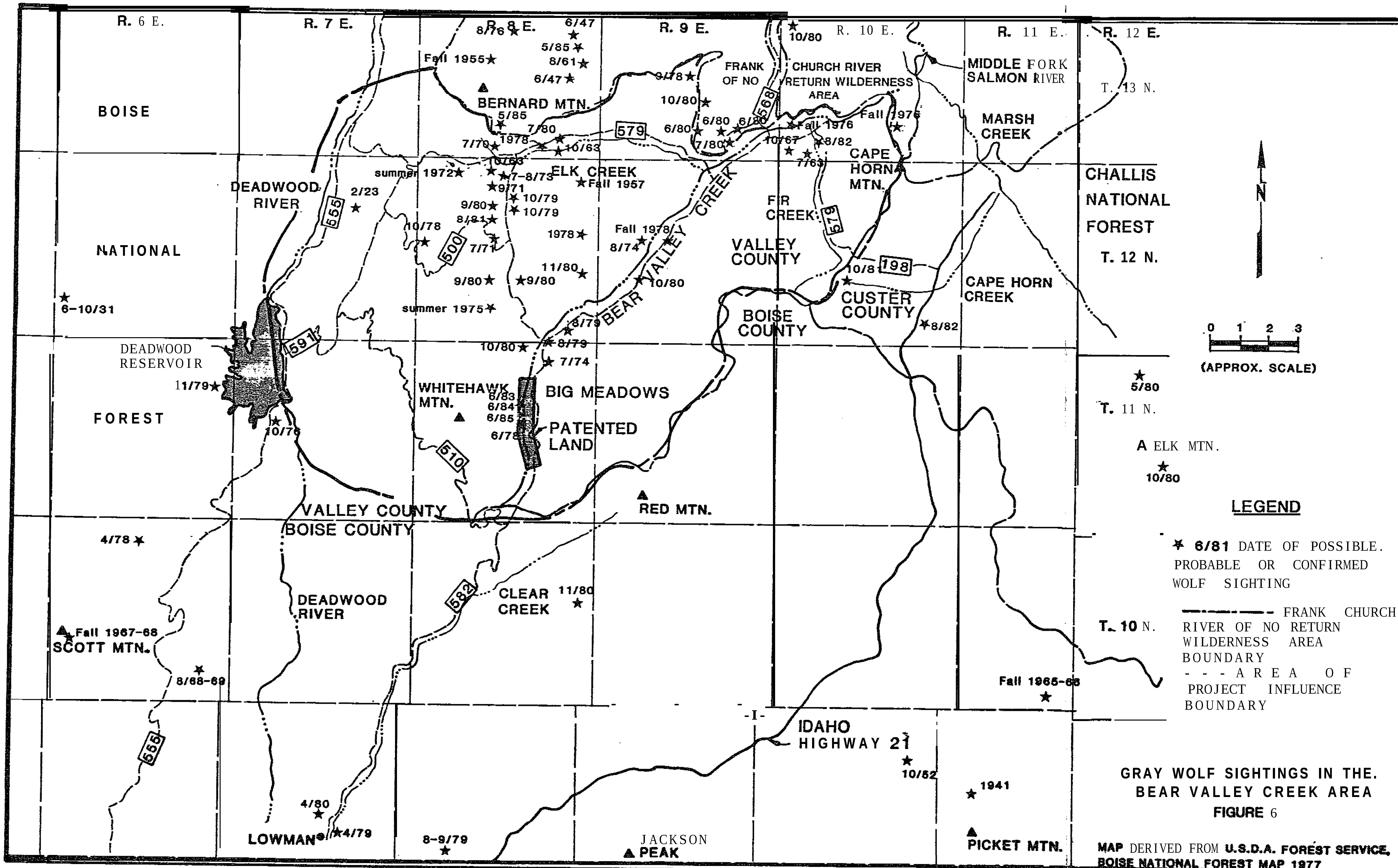
TABLE 1 (cont.)

Date	Legal Description	Location	Rating*
Oct. 1980**	T.11N.. R.SE.. Sec. 3	North of Bearskin and Bear Valley Creek Road Junction	Probable Sighting
Nov. 1980**	T.l2N., R.8E. Sec. 23, 24, 25,26	Sheeptrail Creek; less than 1 mile from Sack Creek	Probable Sighting
Nov. 1980	T.10N R.8E., Sec. 13	Near Corral Creek	Probable Sighting
Aug. 1981**	T.lZN., R.SE., Sec. 9	Lower end of South Fork Deer Creek	Probable Sighting
Oct. 1981	T.lZN., R.lOE., Sec. 21	Near Fir Creek	Probable Sighting
Aug. 5, 1982	T.lZN., R.lOE., Sec. 35	Near Banner Creek	Probable Sighting
Aug. 11, 1982**	T.l3N., R.lOE., Sec. 32	Bruce Meadows	Probable Sighting
June 1983-85**	T.IlN., R.SE., Sec. 15,22	Near dredge ponds in Bear Valley	Sightings currently under investigation
May 24, 1985**	T.l3N., R.BE., Sec. 33	Between Elk Creek and wet meadow off of road	Possible Sighting

Sources: Kaminski and Boss, 1981.
Donohoo, 1985. Personal communication.

*Sightings are listed in order by date.

**Sightings reported within "are of project influence." See Figure 6.



GRAY WOLF SIGHTINGS IN THE BEAR VALLEY CREEK AREA

FIGURE 6

MAP DERIVED FROM U.S.D.A. FOREST SERVICE, BOISE NATIONAL FOREST MAP 1977

There are other signs of potential wolf activity in the Bear Valley Creek area. Reported observations of wolf scat, tracks, and howling incidents in the Bear Valley Creek area are summarized in Table 2. The locations of reported wolf scat, tracks and howling incidents are shown on Figure 7. and many occur within the “area of project influence” as defined by USFWS biologists.

Causative factors responsible for the decline of the wolf population include trapping, hunting, poisoning, land development, loss of habitat, and the inability of man to tolerate the wolf. Human caused mortality has had a major impact on wolves throughout the historical range of the Northern Rocky Mountain gray wolf. Wolf mortality directly attributed to humans following legal protection of wolves has been documented by several prominent. research biologists (Mech, 1977; Fritts and Mech, 1981; Berg and Ruehn, 1982). The present range of the gray wolf in the Northern Rocky Mountains is limited to western Montana, northwestern Wyoming, and the central and northern mountains of Idaho, based on reported sightings within the last ten years (Flath, 1980; Kaminski and Hansen, 1984).

Potential for Wolf Activity in the Bear Valley Creek Project Area

The Bear Valley Creek Project area and vicinity contains some of the key wolf habitat components found on the Boise National Forest. These key habitat components include traditional elk calving and nursery areas, ungulate summer range, beaver and other alternate prey habitat, and potential wolf homesites (dens and rendezvous sites) (Kaminski and Hansen, 1984). The primary use of the immediate project area by wolves would be during the late spring and early summer months when elk are present along the fringes of Big Meadows. The reported sightings in the immediate project area help affirm that wolves use the south Big Meadows area during the spring and early summer months. Reports of wolf sightings during the month of June over the past three years within the dredge mined area are currently under investigation by biologists from the USFWS, Idaho Department of Fish and Game (IDFG), and USFS (L. Donohoo, personal communication, 1985). Several wolf sightings have been reported in the north Big Meadows area from July through October in recent years.

TABLE 2

WOLF SIGN OBSERVATION IN THE VICINITY OF BEAR VALLEY CREEK FISH HABITAT ENHANCEMENT PROJECT AREA

DATE*	Legal Description	Location	Rating
May 1945	T.l3N., R.8E., Sec. 13,14, 23,24	**Corduroy Meadows**	Probable Tracks around freskry killed elk calf
a June 1946-47	T.llN., R.llE.	10 miles north of Grandjean	Probable Tracks
July 1976	T.l3N., R.8E., Sec. 13	Near junction of Porter Creek-Elk Creek	Probable Howling
July 16, 1979**	T.12N., R.10E., Sec. 6	Bruce Meadows	Probable Howling
July 1979**	T.l3N., R.8E., Sec. 25	2 miles northeast of Elk Creek R.S. in Bear Valley	Possible Scat
July 1979**	T.l3N., R.9E., Sec. 26	Near Bruce Meadows	Probable Howling
Aug. 1979**	T.l3N., R.9E., Sec. 31	Bear Valley, l/2 mile south-west of Elk Creek Road	Probable Howling
Aug. 1979**	T.l3N., R.9E., Sec. 30	1 mile northwest of Elk Creek Road	Probable Howling
Aug.-Sept. 1979	T.9N., R.8E.	Ridge above Kirkham Hot springs	Probable Sighting, Howling
Sept. 1979**	T.12N., R.9E., Sec. 20,21	Near Sack Creek Campground	Probable Howling,
Nov. 14, 1979**	T.llN., R.7E, Sec. 12	Whitehawk Basin	Probable Tracks
Nov. 1979	T.llN., R.6E., Sec. 12	Near South Fork Beaver Creek	Probable Tracks
Feb. 1980	T.l3N., R.7E., Sec. 14	Bernard Creek and north of East Fork Deadwood River	Probable Tracks
Sept. 1980**	T.l3N., R.EE., Sec. 26	West of Lower Corduroy Meadows	Possible Scat
July 1981**	T.l3N., R.8E., Sec. 35 or 36	Near Elk Creek Ranger Station	Probable Howling
Oct. 1981**	T.9N., R.8E., Sec. 20	Near Lick Creek	Probable Tracks

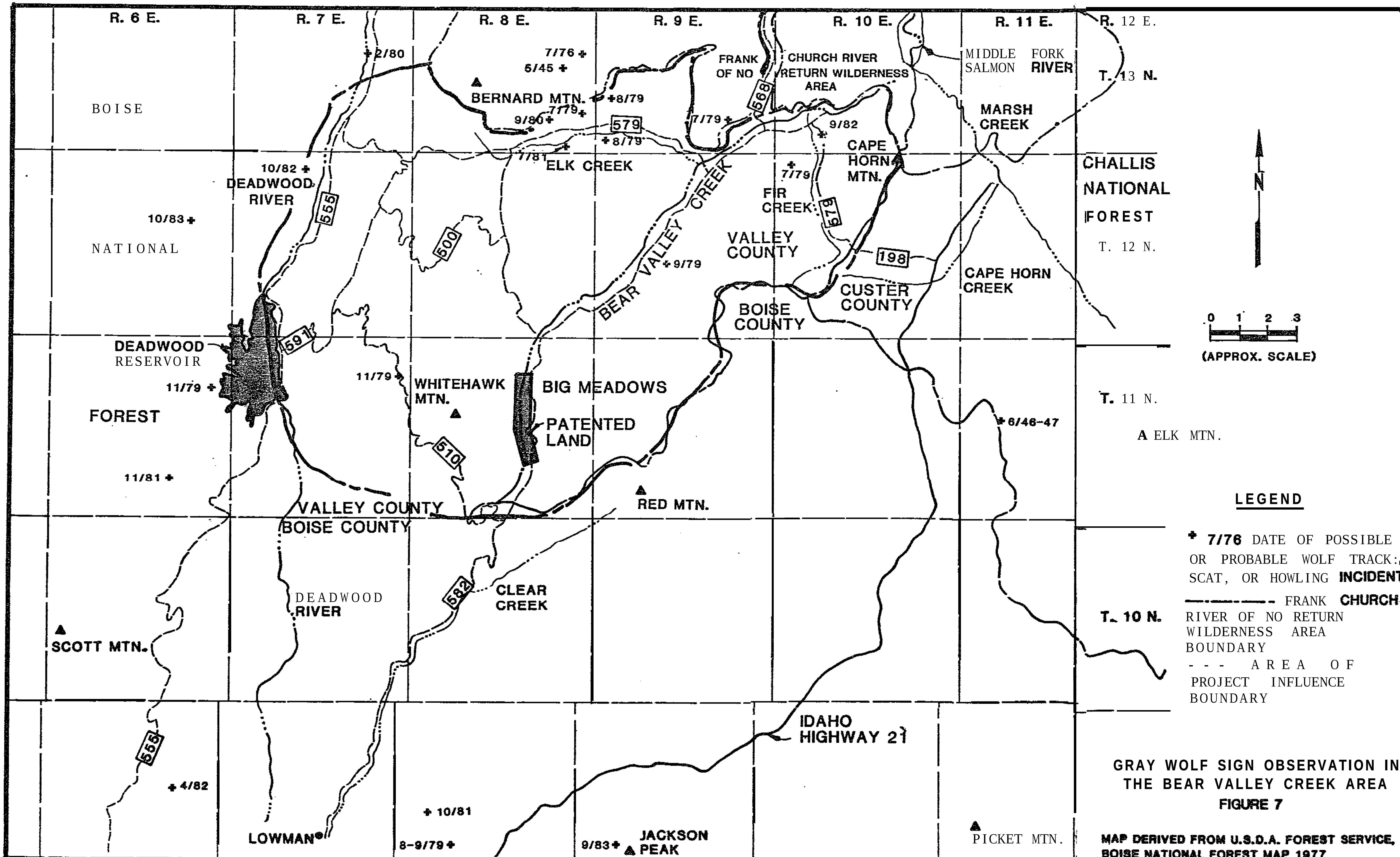
TABLE 2 (cont.)

Date*	Legal Description	Location	Rating
Nov. 1981	T.llN., R.6E., Se;.' 27	Near Lightning Creek	Probable Tracks
April 1982	T.9N.a R.6E., Sec. 23	Near Fir Creek	Possible Tracks
Sep. 16, 1982**	T.13N.. R.lOE., Sec. 32	Bruce Meadows	Probable Howling
Oct. 1982	T.lZN., R.7E., Sec. 4	Near Deadwood River	Probable Howling ,
Sept. 1983	T.9N., R.9E., Sec. 32	Near Jackson Peak	Possible Tracks
Oct. 6, 1983	T.lZN., R.6E., Sec. 14	'Near Silver Creek	Possible Tracks. Howling

Source: Kaminski and Boss, 1981.

*Observations are listed in order by date.

**Observations reported within "area of project influence." See Figure 7..



GRAY WOLF SIGN OBSERVATION IN THE BEAR VALLEY CREEK AREA

FIGURE 7

MAP DERIVED FROM U.S.D.A. FOREST SERVICE, BOISE NATIONAL FOREST MAP 1977

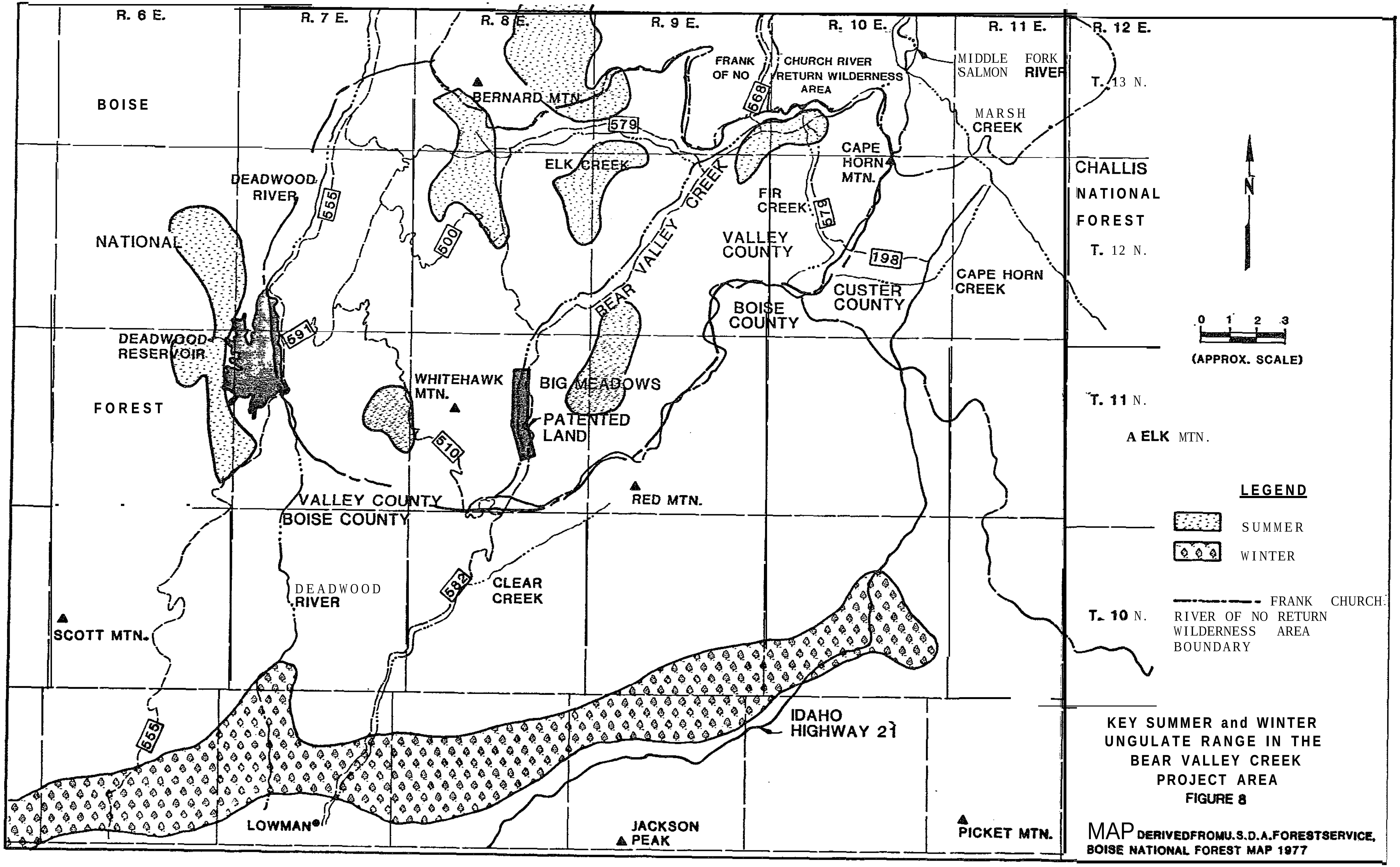
Wolf use of the Big Meadows area could potentially increase during years that the upper Bear Valley Creek pasture is rested from livestock grazing. There is a high degree of potential conflict between wolves and livestock grazing in the Bear Valley Creek area (Kaminski and Hansen, 1984). The grazing allotments in Bear Valley Creek overlap areas of key wolf habitat components.

The total number of wolves which could be supported within the Boise National Forest has been estimated using an equation developed by Keith (1982). This equation estimates the wolf population that could be supported by population estimates of prey base including elk and mule deer within game management units. An estimate of 26 wolves has been calculated based on 1981 population counts of elk and mule deer on IDFG game management units 25, 33, 34, and 35 (Kaminski and Hansen, 1984).

Analysis of wolf reports from the Bear Valley-Warm Lake area indicate that reproduction has been successful (Kaminski and Boss, 1981; Kaminski and Hansen, 1984). Several sightings of adult wolves with pups and/or pairs of adult wolves are documented in reports filed with the USFWS. Identical groups of wolves have been reported by separate parties in different locations several weeks apart.

Prey Base

The primary prey base for the gray wolf consists of elk (Cervus elaphus nelsoni) and mule deer (Odocoileus hemionus). Beaver (Castor canadensis) is a secondary prey species where available. The Bear Valley Creek project site is located within IDFG Management Unit 34. Ungulate winter range in the region is located along the South Fork of the Payette River drainage, outside of the area of project influence (Figure 8). Ungulate summer range is found throughout the Bear Valley Creek drainage (Figure 8), however, elk will avoid these areas if livestock are grazing in the meadows (L. Donohoo. personal communication. 1985). The presence of livestock in the summer ungulate range causes a displacement of elk into the higher ridges and meadow areas. Elk are the primary wolf prey species that occupy the upper Bear Valley Creek drainage.



KEY SUMMER and WINTER UNGULATE RANGE IN THE BEAR VALLEY CREEK PROJECT AREA
FIGURE 8

MAP DERIVED FROM U.S.D.A. FOREST SERVICE, BOISE NATIONAL FOREST MAP 1977

The wildlife management agencies estimate that IDFG Unit 34 had a 1981 elk population of 650. Recent management activities within Unit 34 have resulted in a 1985 elk population estimated at approximately 850 animals (Kaminski and Hansen. 1984). Donohoo (personal communication, 1985) estimates that up to 60 elk graze in the Big Meadows area: during years when the pasture is being rested from livestock grazing. The 1985 estimate of mule deer within Management Unit 34 is approximately 1400 animals, however, most of the mule deer population inhabits areas outside of the upper Bear Valley Creek drainage. The Bear Valley Creek area receives moderate hunting pressure due to accesibilty from the Boise area.

DISCUSSION

Area of Project Influence

The area of project influence was established by USFWS biologists through comparison of the proposed construction activiey with the general topography of the region and an overview of wolf sightings in the project vicinity (J. Gore and J. Hansen, personal communication, 195). The area. of project influence shown in Figures 6, 7, and 8 extends notth to the Frank Church River of No Return Wilderness, west to Deadwood River and Deadwood Reservoir, and south and east to the Valley County/Boise County line along the natural drainage boundary of Bear Valley Creek. The boundary was delineated solely based on potential impacts or effects the project could have on andy wolves, inhabiting the Bear Valley Creek region. Establishmant of the area of project influence also provides a specific area within which opotential impacts on wolves and wolf habitat can be estimated.

Potential Project Effects on Wolves

The proposed, Bear. Valley Creek Fish Habitat Enhancement project is not expected to have direct adverse effects of either wolves or their prey base. Based upon reported sightings to date, wolves utilize the immediate project area only during the spring. Wolf sightings within the private land boundaries have been reported only for the month of June, which corresponds to the period that elk inhabit the meadow fringe areas. The immediate project area is not expected to provide potential homesites for wolves because of the main road access through Bear Valley and the amount of human related activity in Bear Valley. Creek during the summer months. Probable use of the area surrounding the project site by wolves is for securing prey during the spring months.

The proposed project, as presently planned, would be under. construction in September 1985 and after July 15 in future years. Construction of the improvements including use of heavy equipment probably would not have a direct effect on the wolf, because sightings reported during these periods are concentrated in an area north of the patented land. There are no reported 'wolf sightings along Forest Route 582 from Lowman to the project site during the months of planned construction activity. Project requirements for riprap (rock) material will involve development of a source located outside of the immediate project area. A tentative riprap site has been identified in conjunction. with the USFS. The riprap site is located in Bear Valley approximately two miles southeast of the project site along Forest Route 502. Development of the riprap site will include surface Clearing, drilling, blasting, loading, and hauling the rock material. There are no reported wolf sihgtings in the area surrounding the riprap site or along the road to the site.

The project area will be fenced following completion of construction during each year to protect the stabilized and revegetated slopes from livestock use. The fencig is not expected to have any direct effects on wolves that may use the immediate project area.

The proposed project may have minor indirect effects on wolves. The wolf sightings shown on Figures 6 and 7 occur mostly during the summer and fall recreation seasons. The increase in activity at the south end of Bear Valley due to the construction could result in an increase in potential wolf activity in the north end of Bear Valley. This effect would be temporary because the overall, project construction will be completed within several years. The daytime increase in human activity within the immediate project area will increase the potential for a wolf-human encounter. However, wolves have not been sighted in the immediate project area during the months of proposed construction activity. The increased number of people in Bear Valley raises the potential for illegal hunting activities during non-hunting seasons, which could affect the welfare of prey species or even result in wolf mortality. Beneficial indirect effects on the wolf may include an improement in the riparian habitat which could attract potential prey. Fencing of the improved area to exclude livestock cuold result in attraction of prey species to the project area following completion of construction activity.

Long'term effects of the proposed project are difficult to estimate due to the cumulative effects of other human activity in the area of project influence. The Bear Valley Creek Fish Habitat Enhancement project is generally not expected to have any long term effects on wolves: Long term effects could only, be identified after specific monitoring for wolf activity in the area of project influence.

The Draft Wolf Management Guidelines' for the Northern Rocky Mountains has been developed by the Wolf Recovery Team for continued management of the wolf on National Forest System lands, wilderness areas, and in National Parks. Three management zones have been established by the Wolf Recovery Team, however, the zones have not been assigned to specific areas. the proposed project site would probably fall within Zone 1 which includes key habitat components. The proposed project involves habitat improvement activities which are consistent with the draft management guidelines for maintaining and improving wolf habitat. Stabilization and revegetation of the riparian zone along Bear Valley Creek as planned would improve habitat for ungulates and other prey species, which could in turn improve the wolf habitat.

Welfare of the Wolf Prey Base

The welfare of the wolf prey base, believed to be primarily elk, is crucial to the survival of the wolf. In addition to elk kills by wolves, the herds are controlled by other factors including sickness leading to death, seasonal starvation. legal hunting, illegal hunting, and road kills. The legal elk hunting season for IDFG Management Unit 34 begins October 2 and continues for 30 days, unless closed earlier. The legal deer hunting season for Unit 34 begins October I6 and ends November 10, unless closed earlier. Legal game animals include only antlered elk and antlered deer.

The increased number of people in Bear Valley during the project construciton seasons could increase the number of legal and illegal big game kills in the area. Elk herds inhabiting the Bear Valley Creek area are considered a key habitat component and primary prey base for wolves. Increased legal hunting. of big game as a result of the proposed project is not expected to affect the wolf opulation. Any potential increased hunting pressure related to the proposed project would be counteracted by housing construotion workers, in the Lowman area. Deliberate illegal game taking would also be controlled by housing construction workers outside of the Bear Valley area. However, road hunting could increase during daily commutin periods and illegal road hunting could potentially affect a herd that functions as a primary prey base.

The prey base can also be disiapted by activity on roads. Elk will avoid habitat adjacent to open forest or meadow roads with traffic for distances up to 0,.5 miles (Lyon, 1979; Perry and Overly, 1976). The incressed commuter and construction related traffic may keep elk and deer away from the ,project site. The potential for road kills of big game-would increase during the project construction, however, loss of animals due to road kills is not expected to significantly affect the ungulate population

The long term effects of the project on the prey base are expected to be beneficial. The project would improve riparisn habitat and cover for ungulates, and the improved areas would be fenced to exclude livestock. The fencing is not expected to prevent elk and deer from utilizing the stabilized and revegetated areas. The riparioan stabilization and revegetation also may attract beaver into the completed project area. All of these beneficial effects would be long term and could only be verified through post project monitoring.

Potential for Direct Wolf Mortality Due to Wolf-Human Encounters

The proposed project has some potential for resulting in direct wolf mortality due to wolf-human encounters. The short term increase in human population due to construction within Bear Valley increase the potential for a wolf-human encounter. Carrying of firearms in vehicles increases the potential of direct wolf mortality if a wolf-human encounter should occur. However, the only reported sightings of wolves in and near the project area occur before the construction personnel would be on the site during any year of the phased stabilization and revegetation activity. The presence of a night caretaker at the site during the construction season would increase the potentail for a wolf-human encounter.

The closest established human population is located at Lowman 15 miles from the Bear Valley Creek project site. Highway access between Lowman and the Boise metropolitan area is maintained, throughout the year. Bear Valley is a popular winter recreation area for snowmgbilers, however, no winter sightings of wolves have been reported for the Big Meadows area. Wolves appear to avoid areas seasonally inhabited by humans,, however, they may use these same areas when people are not present (Peterson,, 1975)..

Cumulative Effects

Possible cumulative effects of the proposed project on the gray wolf are evaluated in terms of other projects and/or activity in the vicinity of the Bear Valley Creek project site. Other human activities in the Bear Valley Creek area include fish habitat studies, livestock grazing, transportation. recreation [camping:, hiking, hunting, sightseeing), woodcutting, and timber harvesting., All of these activities increase the seasonal human population in the area and consequently ***increases*** the ***potential*** for a wolf-human encounter. There are five separate 1985 fish habitat studies being conducted within the area of project influence. These studies are research and/or monitoring oriented, and each group involves several people. The studies are being conducted by the following entities:

- Shoshone-Bannock Tribes Fisheries Department in field, with s&contractor (JMM) making intermittent trips into the project area;

- Shoshone-Bannock Tribes Fisheries Departmetn in-field aerial and instream studies;

- USFS-Boise National Forest, through a field subcontractor;

- USFS-Intermountain Forest and Range Experiment Station;

- USFWS, through a field subcontractor; and

- IDFG, primarily using an aerial survey.

The potential cumulative effect of these habitat studies would be to displace wolves from key habitat into areas 'with less desirable habitat because of the human activity. Some of these fish habitat studies are scheduled only for 1985,, and others are being conducted as long term studies. The studies, are. generally being conducted from June through October.

Livestock grazing effectively displaces the primary prey base for wolves throughout much of Bear Valley (L. Donohoo, personal communication, 1985). The potential for direct conflict between wolves and livestock is high throughout the Bear Valley area. However, there are no records or reports of .-depredation on livestock by 'wolves within the area of project influence (Kaminski and Hansen, 1985). Livestock use of the immediate project area during construction is expected to be minimal.

The Bear Valley Creek project area provides a transportation corridor for numerous government and private vehicles throughout the summer and fall months. Passenger vehicles, light duty trucks, and large multiple axle trucks utilize Forest Route 582 for access into Bear Valley or other nearby areas. There are no reported vehicle-wolf accidents, however, many of the sightings listed in Table 1 were made from vehicles. The primary effect of vehicular transportation on wolves is potential displacement to other areas with little or no human activity. The Bear Valley Creek project will cause increased seasonal traffic on the road between Lowman and the construction site, however, this area has no reported wolf sightings. There will be no project related traffic north of the construction site.

Recreation including camping, sightseeing, hiking, and hunting within the Bear Valley Creek area is aided by the relatively easy, access from Lowman and Stanley. Recreation use of Bear Valley is not expected to increase as a result of the project construction because the contractor's employees will be housed in Lawman. Hunting increases the potential for a wolf-human encounter and direct wolf mortality. However, the project is not expected to significantly increase the hunter population in Bear Valley.

Woodcutting and timber harvest activities in the Bear Valley Creek area are expected to have minims.1 effects on the wolf. Woodcutting by individuals is generally done in roaded areas above the valley floor, and the primary effect on wolves 'may be avoidance of the area of activity. There are no timber sales planned by the USFS in the upper Bear Valley Creek drainage during the next five years (D. Hale, personal communication, 1985). The entire drainage is within the Lowman Ranger District and tributary to the Middle Fork of the Salmon River. This area is not within an existing or proposed wilderness and is scheduled for 1 million board feet of timber harvest per year during the next five years. Most of thisharvest will be accomplished in small commercial cuts which can benefit managed populations of wildlife.

The potential cumulative effect of all the above activities on the wolf is avoidance of the Bear Valley Creek area during periods of human activity. The proposed project is not expected to have additional short term effects on the wolf because the construction activity will be conducted during months when wolves historically are not reported in the upper Big Meadows area. Any potential cumulative effects on the wolf resulting form the proposed project may be mitigated by specific measures enforced during the construction activity. Other unrelated human activity as discussed above is controlled and managed by the USFS through the Lowman Ranger District.

Potential Mitigation

Potential mitigation of the effects of the proposed Bear Valley Creek Fish Habi-*tat* Enhancement ***project*** on the wolf and its habitat are numerous and would be implemented by JMM as the general contractor. These potential mitigation measures include the following:

- Construction will not' be started during any year until July 15'or later, and the construction activity will generally last until the end of October.

- Construction employees. will commute daily to. and from the project site in vans or private vehicles. All construction personnel will live in Lowman except for a night caretaker (if necessary) who will be housed at the site.

- Construction! personnel will be discouraged from hunting in the pro-, ject area before, during, or after the working day.

- The construcion personnel will be encouraged to comply with hunting and fishing regulations as part of a hunter education program.

- Firearms (rifles, shotguns, etc.) will not be allowed in company construction vehicles traveling to and from the project site.

- Education on ‘the wolf, its habitati, and current recovery efforts will be provided to the construction personnel through seminar presentations, pamphlet distribution, and posters provided on the construction site. The education program will emphasize reporting and documenting wolf sightings to ‘the agencies (IDFG., USFWS, or USFS) as soon as possible.

The mitigation measures listed above will, each help protect the wolf and its key habitat components in the Bear Valley Creek area. Delay of construction until July 15 or later will help avoid potential wolf-human encounters, based on current reported sightings in the immediate project vicinity. This date is consistent with the Start of USFS and IDFG activities in Bear Valley each year, Provision of transportation for employees to and from the project site would help control illegal hunting and poaching activity. Discuraement of hunting from the project site on working days will also help control illegal hunting and decrease the potential for direct wolf mortality. Hunter education for construction personnel also will help to control illegal hunting. Restrictions on carrying firearms to and from the project site in company vehicles will help control road hunting and reduce the potential for direct wolf mortality during any potential wolf-human encounters. Education of employees about the wolf through seminars and distribution of literature will help the construction personnel in their understanding the importance of recovering the wolf population. The education program will also help in monitoring potential wolf activity by emphasizing the importance of reporting wolf sightings to the wildlife management agencies. Overall mitigation would be achieved by observing the Draft Wolf Management Guidelines, which will be used in developing the education program.

SUMMARY

The proposed project by the Shoshone-Barmock Tribes is not expected to affect the wolf in a negative way and may have some long term positive impacts on wolf recovery. Although intermittent sightings have been reported in the immediate project area during the month of June over the last seven years, no wolf activity has been recorded during the planned periods of construction. The potential fo wolf-human encounters is increased anytime there is an increase in people, however, the project work force will not be living, at the construction site. The potential for affecting big game herds by the project is increased, however, mitigation measures discouraging hunting and restricting the type of firearms allowed on the construction site will help protect prey base populations. Education of the construction employees about the wolf, prey base, and hunting safety will help minimize any undesirable wolf-human encounters and protect elk and deer populations from illegal over-utilization. the long term benefits of t h project in stabilization and revegetation along Bear Valley Creek may be realized by providing more prey base habitat in the riparian zone.

Based upon the above evaluation, it is our conclusion that the Bear Valley Creek Fish Habitat Enhancement project, as proposed by the Shoshone-Bammch Tribes, will not endanger the continued existence of the wolf, and that a “no-effect”~ decision is justified.

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United States Department of the Interior

FISH AND WILDLIFE SERVICE

BOISE FIELD OFFICE
4696 Overland Road, Room 576
Boise, Idaho 83705

August 30, 1985

RECEIVED
SEP 3 1985
JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.

Mr. Brian Liming
James M. Montgomery Consulting Engineers, Inc.
1301 Vista Avenue
Argonaut Building, Suite 210
Boise, Idaho 83705

Re: 1-4-85-I-386

Dear Mr. Liming:

We have reviewed the draft biological evaluation of the northern Rocky Mountian gray wolf for the Bear Valley Creek Fish Habitat Enhancement Project, which we received on August 22, 1985. Our major concern with the project is the increased potential for human caused wolf mortality due to the addition of at least twenty construction people into the Bear Valley area. As mentioned in our June 26, 1985 meeting, we would like to see the employees transported to and from the construction site every day in company vans or buses. This will help insure that no guns are brought to the construction site and that employees are not driving roads in private vehicles before and after work. This particular mitigative measure should replace the second measure on page 14 of the draft biological evaluation.

With other Activites and studies ongoing in Bear Valley this summer, and those to follow, we feel that this conservation measure will help alleviate potential cumulative impacts to the wolf.

Because of the larg number of wolf reports from this key wolf area, the existence of an occupied den site or rendevous site near the project site is possible. should one be discovered, potential project impacts on the occupied.. site will be immediately evaluated by the U.S. Fish and Wildlife service and the Idaho Department of Fish and Game. Changes in the construction schedule, may be necessary.

Thank you for the opportunity to comment.

Sincerely yours,

John P. Wolflin
Field Supervisor

cc: FWS, AFA-SE, Portland
IDFG, Hdqtrs., Boise
IDFG, Region 3, Boise